SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1888, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LVIII.—No. 1. [NEW SERIES.] NEW YORK, JANUARY 7, 1888. [$3.00 per Year.

(60165)

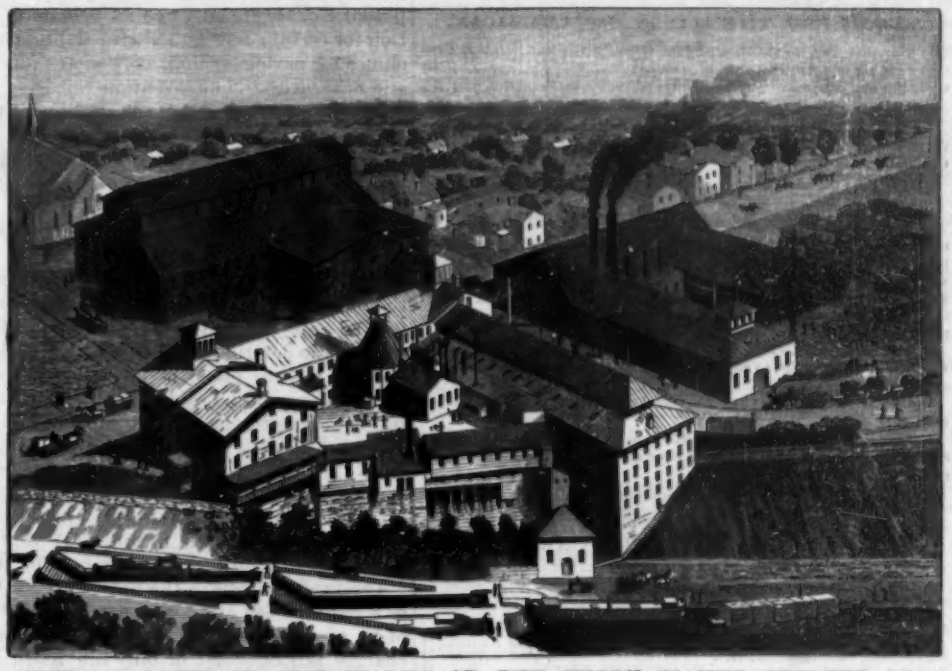
WORKS OF THE HOLLY MANUFACTURING CO., AT LOCKPORT, N. Y.

In the present issue we give illustrations of the works of the Holly Manufacturing Company, of Lockport, N. Y. The company is an old one, having been organized in 1859. It was originally devoted to exploiting the inventions of Birdsill Holly, the originator of the widely known Holly system of water works. This system provided for the supply of water at constant pressure without reservoir or standpipe, the pumps working directly into the mains.

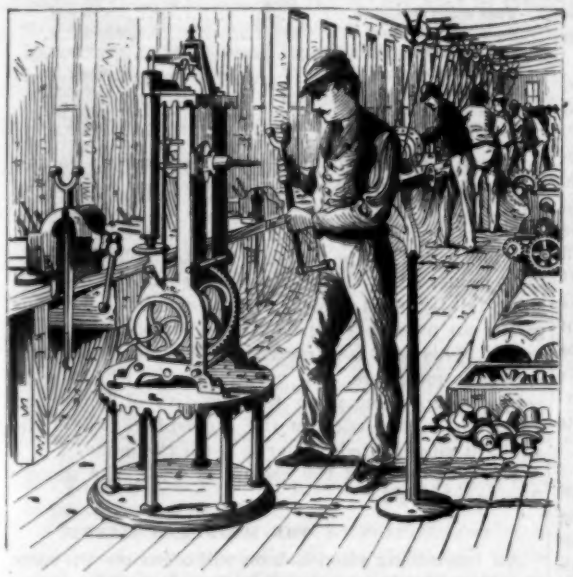
Since those early days it has acquired new prominence by the production of the Gaskill pumping engine, the invention of Mr. H. F. Gaskill, now chief engineer of the company. Various improvements had been introduced by Mr. Holly in the pumping engines used in his system. His last development was the quadruplex engine. In this form four steam cylinders are used, inclined in two pairs at 45° from the vertical and toward each other. In the prolongation of the steam cylinders are four water cylinders. This engine worked perfectly. The first one was erected at Dunkirk, N. Y. This engine was built later on the compound principle, and the first compounded one was erected at Rochester, N. Y., in 1874, about three years after the invention and development of the original quadruplex engine.

It was in 1882 that the Gaskill engine was invented which has since superseded all others made by this company. In its high duty, with its features of general excellence, it may be pronounced unsurpassed. In the early days of hydraulic engineering in this country, but little attention was paid to the duty question. As long as an engine pumped enough water and ran day after day without exacting extensive repairs, the engineer was satisfied. But when the economy of fuel began to be felt as a more important issue, and when rival engine builders began comparing their figures of foot pounds per 100 pounds of coal consumed, Mr. Gaskill addressed himself to the task of developing an engine that should compare favorably with the best. In 1882 his first production was set up in Saratoga Springs, N. Y. This engine has been in constant use for the intervening years. The engineer has made daily records of its work. From these it appears that this pioneer engine of the Gaskill type has given since its erection an average duty of about 105,000,000 foot pounds per 100 pounds of coal burned. This it does without being worked to more than one-half its full capacity. Working up to its entire power, it can raise

(*Continued on page 4.*)

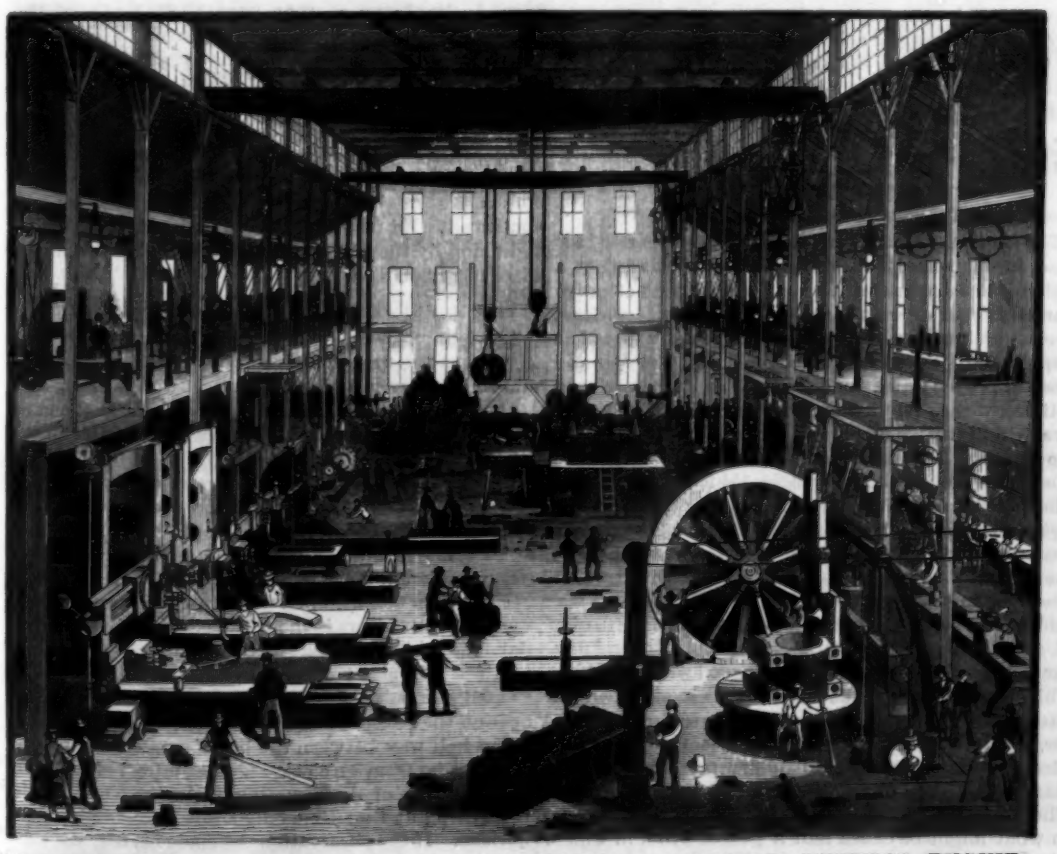


GENERAL VIEW OF THE WORKS OF THE HOLLY MANUFACTURING CO.

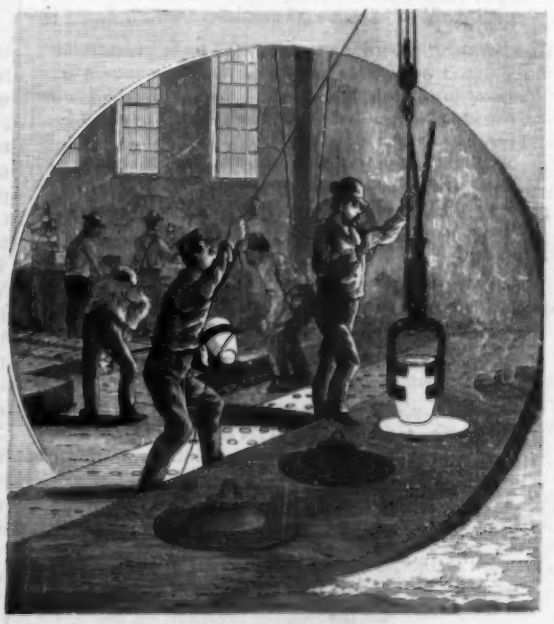


THE UPPER SHOP.

THE PATTERN SHOP.



NEW ERECTING SHOP FOR GASKILL HORIZONTAL COMPOUND PUMPING ENGINE.



THE BRASS FOUNDRY.

Scientific American.

ESTABLISHED 18--5.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S. or Canada $3 00
One copy, six months, for the U. S. or Canada..... 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of seven dollars.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, JANUARY 7, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 627.

For the Week Ending January 7, 1888.

Price 10 cents. For sale by all newsdealers.

PATENTS BY JOINT INVENTORS.

When two or more persons jointly invent a new improvement, the patent therefor may be properly issued in their joint names. But if one specific part is the invention of one of the inventors, and another specific part invented by the other party, the patent, if taken as a joint invention, is invalid. In such cases two separate patents should be taken, one by each inventor. This is well illustrated in a trial lately had in the United States Circuit Court, Southern District of Illinois, before Judge Gresham.

STEWART *et al. v.* TENK.

John Stewart and Will Campbell obtained letters patent No. 140,315 on June 24, 1873, for a joint invention for certain new and useful improvements in machines for paring, slicing, coring, and dividing apples and other fruit. The invention consists:

. . . First, in providing the said device with a paring knife so operated as to remove the skin of the fruit from all parts thereof outside of the parts operated upon by the coring knife; second, in conjunction with said paring knife, providing a convex anti-friction roller, to prevent any friction upon the device by the fruit when being operated upon; third, in providing the arm upon which said paring knife is mounted with the segment of a cogged guide or flattened sphere, so formed as to enable the said paring knife to operate upon a line describing one-half of the periphery of the vertical central plane of an ordinary shaped apple; fourth, in providing said segmental cog with a yielding ratchet, to assist the rotation of the cog and the preservation of an even pressure of the paring knife upon the fruit; fifth, in providing said device with a coring knife, which is so arranged that its cutting edge comes in contact with the parts of the fruit about the core with a draw cut; sixth, in providing said device with a double spiral fork for securely holding the fruit.

The twelve claims in the patent are for the machine as a combination and for separate and distinct portions of it as separate and distinct inventions. The bill charges infringement of only the tenth claim, which reads as follows:

"10. The combination of the arched coring knife, *i*, and slicing knife, *h*, substantially as shown and described."

It was insisted by the defendants' counsel that Stewart alone invented the arched coring and slicing knife, and that therefore a joint patent for this distinct invention was unauthorized. Stewart testified that he conceived the idea of combining the slicing and arched coring knife as it is described in the patent, and that he gave instructions to Campbell how to make the knife. He further testified that certain other parts of the combination which are covered by separate claims in the patent were invented by him, while other parts were invented by Campbell. Campbell also was examined as a witness; but his testimony on these points did not differ materially from Stewart's.

The judge held that Stewart and Campbell were entitled to a joint patent for what they jointly invented. It may be that their minds co-operated in combining the different parts which resulted in the production of the complete machine; but a joint patent can be sustained only for a joint invention, and the evidence shows that Campbell did not contribute to the invention covered by the tenth claim. Stewart was the sole inventor of the slicing and coring knife, and the patent for that, as a separate and distinct part of the machine, should have been issued to him alone. (Worden *v.* Fisher, 11 Fed. Rep., 505; Consolidated Bunging App. Co. *v.* Woerle, 29 Fed. Rep., 450.)

The bill was dismissed for want of equity.

TORPEDO BOATS IN A GALE.

The recent tests of torpedo boats at Kronstadt brought out some interesting facts, and will do not a little toward demonstrating that for the most effective work this class of craft must be divided into at least two general classes—sea-going and smooth water. The torpedo boats tested were all of them of the newest and most approved types, and, since these tests were competitive, we are enabled to form some idea of the relative skill in this description of naval architecture of the English, French, German, and Russian builders. There was the Sneaborg (French), 154 feet over all; the Vintara (German), 125 feet; the Kotling (Russian), 100 feet; and the Wiburg (English), 142 feet. The French boat was said to have a speed of twenty-two knots on the measured mile, but could not log more than twenty-one, even in a fairly smooth sea; the Englishman was said to be good for 25 in smooth water, the Russian 24, and the German about the same. On the third day, the sky lowered, the sea rose, and a good whole-sail blow which was prevailing developed into a gale, with a nasty sea running. This was a fortunate circumstance, for, as we know, the trials of torpedo boats so often take place in smooth water and under favorable circumstances that they have come to mean little or nothing. There was a trial in the English Channel, a while ago, in what might be called half a gale of wind, in which, of a fleet of 43 torpedo boats, not more than half a dozen could keep their noses up to it, and these pitched and rolled and made such a serious matter of it that it was necessary to seek shelter. In the recent trial the Frenchman was the only one that could weather the gale and the seas. He toiled up the big seas after the foam crests atop and dashed down the other side with the same pertinacity as a ferret chasing a rabbit over foothills. The German had his hands full at the start keeping the water out of his engine room, and early in the day turned about and ran to make a harbor. The Englishman, too, had more weather than he could tackle, and the Russian alternately put his nose or stern under way up to the midship section, and his crew, giving up the test of speed, devoted themselves wholly to the important duty of trying to keep above water.

These boats that acted so badly were filled chock-a-block with machinery, while the Frenchman, while not able to keep up with them in smooth water, began to forge ahead as soon as the winds and seas increased. The splendid way in which this French torpedo boat—built, by the way, by M. Normand, at Havre—stood up and rode over the heavy seas would seem to show that sea-going torpedo boats are not so impracticable as was thought, and that, even on the agitated surface of the ocean, such boats, being let down from the deck of a war ship, can pick their way tenaciously through heavy seas toward an enemy who thinks himself secure from such craft amid the raging elements.

THE CELESTIAL WORLD.

TOTAL ECLIPSE OF THE MOON.

The moon will be totally eclipsed on January 28. The phenomenon will be generally visible throughout North and South America, Europe, Asia, and Africa. The conditions for observation will be specially favorable, as the spectator will neither be obliged to sit up late in the evening nor get up early in the morning for a view of the interesting exhibition.

The eclipse takes place in eastern standard time as follows:

	h. m.
Moon enters penumbra	3 27·5 P.M.
Moon enters shadow	4 30·2 P.M.
Total eclipse begins	5 30·7 P.M.
Middle of the eclipse	6 19·9 P.M.
Total eclipse ends	7 9·0 P.M.
Moon leaves the shadow	8 9·3 P.M.
Moon leaves penumbra	9 11·7 P.M.

It will be seen that the moon enters the earth's shadow before sunset, but when the total eclipse begins, at 5 h. 30 m. P. M., it will be dark enough to watch its progress through the most interesting stage. The moon will not be entirely lost to sight when totally immersed in the earth's dark shadow. She will shine faintly, with a lurid, copper-colored light, thus giving an unearthly aspect to the surrounding landscape. This light is refracted into the shadow by the earth's atmosphere. It varies greatly in different eclipses, depending upon the quantity of clouds and vapor in that portion of the atmosphere where the sunlight must graze in order to reach the moon.

The magnitude of the eclipse is 1·647, the moon's diameter being 1.

CONJUNCTION OF THE MOON AND SATURN.

An interesting phenomenon will occur on the same day that the lunar eclipse takes place. The moon will be in conjunction with Saturn on the 28th at 8 h. 28 m. A. M., being at that time 1° 10′ south of the planet. When the eclipse occurs, Saturn will be west of the moon, and in her near vicinity, shining brightly while her fair face is hidden from view. After the eclipse is over, the moon, with her full round face, and Saturn, the evening star, only six days after opposition, will make a picture fair to see. Saturn may be readily recognized, for the twin stars Castor and Pollux are on the northwest and Procyon is on the southwest. He may also be known by his soft, serene light and by the absence of bright stars in his immediate neighborhood.

THE MORNING SKY AT THE CLOSE OF JANUARY.

The four planets Venus, Jupiter, Mars, and Uranus, as well as the first magnitude star Spica, may be seen almost in a row near the ecliptic in the morning sky. If the observation be made about 5 o'clock at the close of January, the planets and star will be visible in the following order:

Uranus will be high in the heavens, barely visible to the naked eye, but easily found with the aid of an opera glass or small telescope, about 4° northwest of Spica. The brilliant Spica is the next member of the starry ladder, and needs no pointing out, for it shines in solitary grandeur and is within two hours or 30° of the meridian. Mars is the third comrade in the celestial fellowship, shining with a ruddy hue about 7° northeast of Spica; Mars, Uranus, and Spica forming a small triangle. Jupiter, king of planets, appears next on the celestial track, beaming with light. He is about half way between the horizon and zenith, as he rises not far from 2 o'clock. Venus, fairest of the stars and brightest of the row, completes the shining picture, being at that time only a few degrees above the horizon. If the observation be made earlier, the stars will be nearer the horizon; if it be made later, the stars will be higher in the heavens. The order of ap-

pearance of the stars on the last day of January is: Uranus, Spica, Mars, Jupiter, and Venus. On the 1st of January, it was Mars, Uranus, Spica, Venus, and Jupiter. During the month Venus and Jupiter met and passed each other; Mars overtook and passed Uranus and Spica, thus affording a tangible illustration of planetary wanderings.

PATENT MAPLE SUGAR.

Among the curious inventions for which a patent has been granted is one to Josiah Daily, of Madison, Indiana, by which anybody who likes maple sugar and maple sirup may readily supply himself at a small cost. If the patentee's statement is correct, it is no longer necessary to go through the tedious and exhausting labors of tree tapping and sirup boiling in order to obtain maple sugar. If it should be found that the patent process will also convert into maple sirup a solution of the newly discovered chemical sweet known as "saccharine," which is said to be three hundred times sweeter than cane sugar, or the more recent artificial sugar of Drs. Fischer and Tafel, then the very acme of transformation will have been reached, and the interposition of Congress will be necessary to save the genuine maple sugar industry from going to destruction. This would only be in keeping with the action of Congress last year, in its effort to suppress the oleomargarine butter industry, because the popular taste preferred it to the rancid and dirty stuff called genuine butter which is found in all the markets. But let us return to our subject.

The patent maple sugar is made by simply mixing an extract of hickory with any ordinary sirup, such as cane sugar sirup or sorghum. The patentee says:

"The extract is to be obtained in any convenient manner, such as making a decoction of the hickory bark or wood, or percolating liquid through the same, or drawing off the sap from the tree. The bark or wood of the hickory tree may be ground to facilitate the extraction of its principle, and the extract may be made more or less strong by increasing or diminishing the quantity of bark or wood, or by boiling the extract for a longer or shorter time.

"In preparing sirups, I ordinarily add about three tablespoonfuls of the decoction to a gallon of heated or boiling sirup. Of course the stronger the extract the less the quantity required for flavoring a given amount of sirup. The sirup may be manufactured from any kind of saccharine matter or mixture of saccharine matters, or the sirups ordinarily found in the market may be used. The effect of the extract or decoction is to give to the sirup the flavor of the maple, producing a sirup which cannot be distinguished from genuine maple sirup.

"The high price of maple sirup, as well as its scarcity throughout the country, renders this improved sirup of great value, since a good substitute for maple sirup is thus produced, which comes within the reach of all.

"It is evident that the flavored sirup may be boiled down and a sugar resembling maple sugar in taste may be produced.

"In defining the limits of my invention, I would state that I do not claim broadly the use of extracts of the wood or bark of trees for flavoring sirups or sugars, as I am aware that a decoction made from the wood of the maple has been used for the same purpose. The maple, however, belongs to a different genus of tree from that of the hickory, and it is well known that extracts of wood, as a rule, differ from each other in taste, according to the nature of the tree. I have discovered that the hickory tree will produce the flavor of the maple, and I therefore claim as my invention the use of the hickory extract wherever it may be employed to impart an agreeable flavor.

"I claim:

'1. The method herein described of flavoring saccharine matter, including sirup and sugar, which consists in treating or impregnating the same with the principle or extract of hickory, as specified.

"2. An improved sirup or sugar consisting of any suitable saccharine matter flavored with an extract of hickory, substantially as described."

Supreme Court Decisions.

The following are recent decisions in the Supreme Courts of several States indicated on diverse subjects, all of which are important for business men to know:

Riparian Rights.—The owners of land bounded by a stream declared by act of Congress to be navigable do not acquire title extending to the center of the stream upon the repeal of the act. A railroad company having constructed its track along the bank of such river, inside the limits of high water mark, acquires title as against the adjoining owners, and the riparian owners are precluded from acquiring title by accretion.—C., B. & Q. Ry. Co. *vs.* Porter. Filed Oct. 6, 1887. Iowa.

Patent Needle Machine.—The patentee of a machine, capable of producing needles of a superior quality, subsequently obtained a patent upon the product of such machine. *Held*, that the patent was void, as an attempt to patent the function of the machine, and thus extend the monopoly of the invention beyond the time allowed by law, and that an action could not be maintained against one manufacturing the same kind of needles by the use of the machine after the expiration of the patent thereon, when the right to use it had become vested in the public.—Excelsior Needle Co. *vs.* Union Needle Co., Cir. Ct., S. D. N. Y.

Nuisance—Keeping Troublesome Animals.—A party erected a shed on his lot adjoining the lot of another, and kept there horses, poultry, and hogs. In an application by his neighbor for an injunction restraining him from keeping these animals in such close proximity to his dwelling, an injunction was granted as against the continuance of the nuisance. An unsightly building erected near the residence of another is not a nuisance *per se*, and cannot be enjoined.—Trulock *vs.* Merte. Filed Oct. 10, 1887. Iowa.

Trade Marks.—The use of a trade name, though by a corporation of a company's name, which is a usual name, and having the same sense and a like appearance, is a violation of a trade right as using a trade name. Where an arbitrary name is used for an article, a trade mark may be secured therein, though subsequently the public may give the article the name assumed in description of it. The word "Cellonite" stamped upon goods similar to goods stamped "Celluloid," being the same article, is a violation of the trade mark "Celluloid."—Celluloid Manuf. Co. *vs.* Cellonite Manuf. Co., U. S. C. C., D. N. J.

Master and Servant—Injury to Employe from Defective Machinery.—An employe of a furniture factory was killed, the knife flying out of a rapidly revolving shaper head. The device for holding the knife was a new one, invented by one of the managers of the factory, and had never before been used. In an action for damages for the killing, the court ordered a verdict for defendant, and on appeal the judgment is reversed on the ground that the question whether or not it was a safe implement should have been submitted to the jury.—Marshall, Admr., *vs.* Widdicomb Fur. Co. Filed Oct. 13, 1887. Mich.

Salt Water for Cement Mortar in Winter.

The following German experiments designed to ascertain the effect of frost upon hydraulic mortars and cements gauged with and without the addition of salt to the water have been quoted in the *Revue Industrielle*. Cubes of stones 6 c.c. in area were used in these experiments, and were joined together with cement mixed with water ranging from pure rain water to water containing from 2 to 8 per cent of salt. While the cement was yet fresh, the blocks were exposed in air at a temperature of 20° to 32° Fah., after which they were kept for seven days in a warm room. At the end of this time the specimens were examined. The cement made with pure water was quite crumbled, and had lost all its tenacity. The cement mixed with water containing two per cent of salt was in better condition, but could not be described as good; while that containing 8 per cent of salt had not suffered from its exposure to the lowest temperature available for the purposes of experiment. It is possible that the salt merely had the effect of preventing the water in which it was dissolved from freezing at the temperature named, and so permitted the cement to set in the ordinary way. These results may, however, be usefully cited at this particular season, when outdoor building operations are liable to be suspended on account of frost, and the stability of green work is threatened by the same influence.

Egyptian Porphyry Quarries.

An account of a recent visit to the ancient prophyry quarries of Egypt was given at the last meeting of the British Association, by W. Brindley. Egyptian porphyry has been sought after from the earliest times, as one of the most precious building stones. Ancient writers differed as to the whereabouts of the quarries from which that stone was obtained, and in modern times they were literally rediscovered by Burton and Wilkinson in 1823, and subsequently visited by Lepsius in 1845. The information published by these visitors proving of no immediately practical value, the author determined to follow in the footsteps of Wilkinson, and, accompanied by his wife, he went to Cairo in February last. Having examined the ancient granite quarries at the first cataract, which supplied deep red, rose, and dark gray stone, which was quarried by metal wedges, and not wood (as is generally supposed), the author started from Keneh with a small caravan and supplies calculated to last three weeks. Passing the remains of several Roman stations, the author, on the fifth day, reached an excellent well in the charming Wadi Kitar, hemmed in on three sides by precipitous mountains. Soon after leaving this valley he crossed the watershed (2,400 feet above the Nile), and then traveled along the flank of the immense prophyry mountain of Gebel Dukhan as far as the old Roman station with an old fort. The morning after his arrival the author ascended to the top of a pass (3,100 feet), without having found even a fragment of porphyry; but espying by the aid of a good field glass porphyry coloring on the opposite mountain, he resolved to go there, and his delight knew no bounds when he found the ground there strewn with pieces of the most sumptuous porphyry, and discovered a pitched way or slide, 16 feet wide, down which the blocks were lowered. Further examination led him to the locality where the Romans had extracted their grandest masses, and he found that these quarries had yielded not only the usual spotted variety, but also the brecciated sorts and green grays.

The great quarry was at an altitude of 3,650 feet above the sea, and a road led down from it to an ancient town with workshops. A path led hence to the old town in the valley, further up which are the ruins of a Roman temple. The blocks were formerly carried to the Nile, a distance of 96 miles, but they will in future be conveyed by a gentle incline to the Red Sea, which is about 25 miles distant. On his return to Cairo the author secured a concession to rework the quarries, the terms of which have since been ratified.

PHOTOGRAPHIC NOTES.

Marking Lantern Slides.—It is frequently perplexing to the amateur to tell which side of a lantern slide should go toward the screen. The general guide is to place the slide in the lantern with the film side toward the condenser, and in connection with this subject we take some practical suggestions from *The Camera*, as follows: "We all know what a distressing and common experience it is, during a lantern exhibition, to see an occasional picture placed before the audience upside down. This would be altogether avoided if the operator had a ready means of knowing which side of the glass picture must be placed next to the light, and which was the top of it. The best plan we know of is for each slide to be furnished with a white paper disk, preferably placed beneath the cover glass, so that it cannot be rubbed off. This disk should be placed on the bottom left hand corner of the front of the picture. When the slide is inverted, as of course it must be for insertion in the lantern carrier, this disk will come exactly under the thumb of the operator. It can, moreover, be well seen in the dim light of the exhibition room.

Detecting Leakage in Pipes.

Mr. W. P. Gebhard tells how those who are neither plumbers nor sanitary inspectors may locate the slightest leakage in water pipes by introducing essence of peppermint into them. The best place to do this is outside on the top of the roof, because if the odor is released in a room or around a fixture, even for an instant, it would be impossible to detect a leak afterward. Whoever applies the peppermint should remain on the roof, as he would otherwise carry the odor on his clothes into the house. As to the best means of using the peppermint, some persons pour an ounce or two of pure peppermint into a pail of very hot water, and pour it into the soil pipe, while others pour in the oil and follow it with hot water, taking care while the search is conducted below to cover the top of the soil pipe above the roof. There is thus no chance of escape, unless through leaks in the pipe, and a careful examination of every line of pipe, and around each fixture, will readily enable the investigator to determine where, if any, there is a leak. Care should also be taken that while the examination is being made none of the fixtures shall be discharged, as otherwise the air in the pipes laden with the peppermint odor might find its way into the rooms.

Antipyrin in Seasickness.

In a note presented to the Academy of Sciences (*Compt. Rend.*) M. Dupuy calls attention to the value of antipyrin as a remedy against seasickness. He states that he prescribed to some persons who had previously suffered terribly from seasickness, 3 grms. daily of antipyrin on the three days previous to embarking and the three days following, while some patients continued to take the medicine throughout the voyage, and he has been informed that all these persons crossed the Atlantic without suffering from seasickness. This experience was subsequently confirmed in a communication from M. Ossian-Bonnet (*Compt. Rend.* cv., 1028), who states that in about sixty cases occurring during a voyage to Buenos Ayres and back, he found antipyrin invariably effective in arresting seasickness, though the dose required was variable. In most cases 1·50 gramme was sufficient, the complete effect being produced in about ten minutes. In other cases the dose had to be repeated, but it was never necessary to exceed 3 grammes to produce cessation of the sickness within an hour. In a few cases, where the sickness was so incessant as to prevent absorption by the stomach, the same effect was produced by the hypodermic injection of 1 grain of antipyrin.

Chemical and Allied Industries.

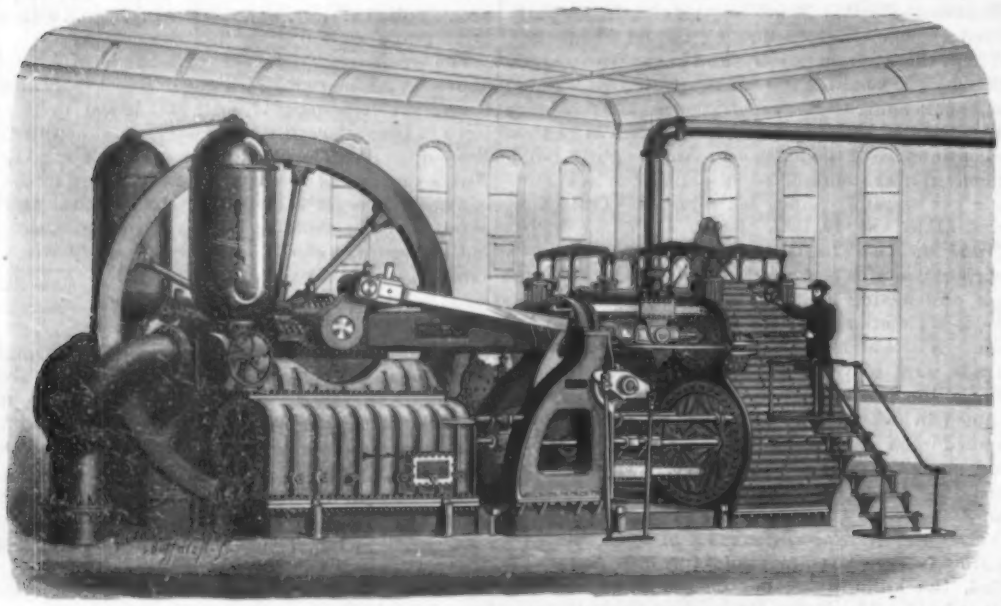
We give in our this week's SUPPLEMENT a report by Professor Watson Smith upon section 3 of the Manchester exhibition, comprising chemical and allied industries. The report is remarkable for the interesting historical information it contains, as well as for the condensed but lucid descriptions of the many substances and apparatuses of which it treats.

WORKS OF THE HOLLY MANUFACTURING CO.

(*Continued from first page.*)

5,000,000 gallons daily. The head it works against is over two hundred feet.

This result attained in the first engine of a new type, and verified by over fourteen hundred days' average, is highly creditable. Since the period when that engine was built, eighty-five of this particular type have been sold by the Holly Manufacturing Company. These engines represent a total daily capacity of three hundred and sixty-two millions of gallons. Mr. Gaskill's efforts in designing this engine were to combine with the utmost simplicity of construction possible a high economy of working. A low original cost was also kept in mind. The engines are constructed both vertical and horizontal, simple and compound. As a representative specimen of the engine, we give an illustration of the compound horizontal engine.



HORIZONTAL CRANK AND FLY WHEEL PUMPING ENGINE.

The high pressure cylinders lie above the low pressure ones. The steam connections between the two are straight and direct, and the steam is admitted to the low pressure cylinders by slide valves. The high pressure cylinder is supplied with steam by poppet valves, forced to their places by springs contained in dash pots. The four oscillating or rocking beams for working these valves can be seen directly above the steam chests. As the high pressure piston is on its back stroke, the low pressure piston is executing its forward stroke. The two are connected by a short walking beam, which works in a vertical plane, between the guide bars of the parallel motion. Short links connect its ends with the piston rods. The main pitmen are connected to the upper end of the walking beam. These drive the fly wheel. The pump cylinders are in the line of the lower or low pressure cylinders, so that with them they preserve the relation of a direct-acting pump. The pump valves are of bronze and India rubber, and work by gravity only. The displacement is by a plunger working through a diaphragm in the center of the water chamber. A full study of the engine, which our space is too limited to afford, is of much interest, and would afford a highly instructive lesson in steam engineering.

The immense advance made by this improvement in the matter of duty may be inferred from the fact that the highly approved Holly quadruplex engine has shown a duty varying from 54,000,000 to 87,000,000 foot pounds, while the Gaskill engine at about its lowest record has given a duty in foot pounds of 102,000,000, and has gone as high as 125,907,000, at Buffalo, N. Y. Among the noted pump engines of the world these figures have only been surpassed in one or two isolated instances.

The works of the Holly Manufacturing Company are situated at Lockport, N. Y., on the Erie Canal. The famous locks are next to the works, and are seen in the foreground of the view. Directly on the towpath a small square building is seen. In this is placed a turbine water wheel. The water to drive it is drawn through a long tunnel from the upper level of the canal above the last lock. This is the lake level, so that the works possess uninterrupted communication with the waters of Lake Erie. A tunnel is excavated in the solid limestone rock for the conveyance of the water. The total fall is fifty-six feet, and with some recent extensions it supplies not only power enough for the use of the factory, but leaves a large surplus which can be leased for other industries. It is safe to say that the water power is unsurpassed.

GENERAL VIEW OF THE IRON FOUNDRY.

From the turbine house the power is carried by shafting to other parts of the factory. The works cover an area of 4¼ acres, and the power is supplied thus to all the shops. The N. Y. C. & H. R. R. is near at hand, and the company have a switch connection with this road. This gives facilities for canal or railroad shipments. The buildings are all of the limestone of the vicinity.

Some idea of the extent and equipments of the shops can be obtained from the views we present of the interiors of the various departments. In them four hundred and fifty men are employed.

The new erecting shop is devoted principally to the construction of the Gaskill horizontal compound pumping engine. Its admirable interior arrangements are evident. Overhead, two traveling cranes worked by square shafting traverse the length of the building. The attendant who directs their movements is carried back and forth with them. He can be seen in the cage on the right of the crane. The planing and general machinery here is of large size, as very heavy work has to be executed.

In the old erecting shop other classes of machinery are built, such as the Gaskill vertical and horizontal direct-acting engines. This shop naturally is not equal to the newer erection in conveniences for work. One of the vertical engines nearly complete is seen in the foreground to the left.

A view in the pattern shop gives some idea of the scale of work done there. The pattern on which the men are shown engaged is for a portion of the 20,000,000 gallon pump now in process of construction for the city of Buffalo, N. Y.

In the lower shop a great variety of work is executed. In it may be seen one of the small direct-acting pumps built for works of the more moderate size, where economy of first cost as far as compatible with perfect machinery is the great object.

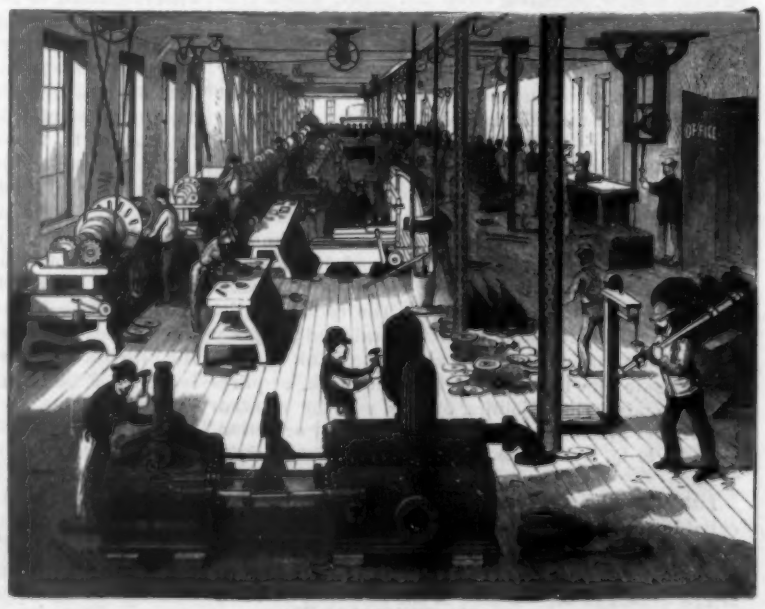
The patterns go from the pattern makers to the iron foundry. Here the moulds are made, and the castings are executed. This immense building is supplied with every facility for the many kinds of work carried out. The drawing gives the general interior arrangement, and shows the size of flasks and moulds required. Overhead is a traversing crane, and jib cranes in addition thereto command the general area of the floor.

The brass work, journals, etc., of the engines are also executed on the grounds. The illustration of the brass foundry represents the men at work drawing out one of the crucibles from the furnace, while in the background the liquid metal is being poured into the moulds.

In the cut of the upper shop, devoted to the lighter work, one of the Holly regulators can be seen. This apparatus is used when the Holly system of water supply is introduced. It acts upon the cut-off of the engine. A dial with movable hand is carried by it. This hand is set to any desired figure denoting the water pressure. This being done, if the pressure rises, the cut-off is shortened, or if the pressure falls, it is lengthened. Fluctuations are inevitable, owing to varying demands upon the supply. The apparatus, if the reduction calls for it, can even cut the steam off entirely. The distinguishing peculiarity about it is that it does not act directly upon the cut-off mechanism. It only throws into action gearing connected with the engine, so that the latter does the actual work of regulating the cut-off. A safety cylinder is supplied to act as auxiliary in case of sudden rise of head.

The works are now engaged on some thirty-one pumping engines, ranging from one to twenty millions of gallons daily capacity.

In addition to the pumping engines and machinery for water works, the Holly Manufacturing Company is largely engaged in the manufacture of fire hydrants and water valves, having a large shop adapted for this work, which is not shown by any of our illustrations. Hydrants are built of all sizes, and adapted for fire ser-



THE LOWER SHOP.

vice either with hose connections to throw streams directly from the hydrants, or with steam connections, as desired.

DUTIES OF GASKILL ENGINES.

Place.	Capacity.	Duty.	Experts.
Saratoga, N. Y.	5,000,000	112,899,983	Prof. D. M. Greene, C. E., Troy, N. Y., and J. W. Hill, M.E., Cincinnati.
Saratoga, N. Y.	5,000,000	106,838,000	Chas. T. Porter, C.E., New York City.
Omaha, Neb.	5,000,000	102,000,000	J. D. Cook, C.E., Toledo, O.
Columbus, O.	10,000,000	115,400,000	T. C. Mendenhall, C.E., Washington, D. C.
Buffalo, N. Y.	15,000,000	125,907,297	Jno. W. Hill, M.E., Cincinnati, O.
Leavenworth, Kan.	5,000,000	110,478,000	Thos. J. Whitman, C. E., St. Louis, Mo.
Hyde Park, Ill.	12,000,000	110,000,000	Chas. Hermany, C.E., Louisville, Ky.
Lima, O.	3,000,000	110,482,946	J. D. Cook, C.E., Toledo, O.
Erie, Pa.	5,000,000	122,442,491	F. A. Scheffler, C.E., Erie, Pa.
Chicago, Ill.	2 12,000,000	102,000,000	Prof. R. H. Thurston, Cornell University, Ithaca, N. Y., Jas. N. Warrington, C.E., Chicago, J. S. Coon, C.E., Burdett, N. Y.
Philadelphia, Pa.	20,000,000	125,022,000	J. E. Codman, C.E., Philadelphia, Pa.

The principal office of the Holly Manufacturing Co. is at Lockport, N. Y., and its officers are: Hon. T. T. Flagler, president; H. F. Gaskill, vice-president and engineer; H. H. Flagler, treasurer.

Branch offices:

C. G. Hildreth, secretary; office 45 Broadway, New York City.

P. H. Linneen, western agent; office 51 Home Insurance Building, La Salle Street, Chicago, Ill.

W. E. Decrow, eastern agent; office 27 Federal Street, Boston, Mass.

Spontaneous Combustion.

The frequent occurrence of fires from spontaneous combustion has led us to more frequently refer to the subject in these columns than we should, were it not important to everybody to be constantly on the watch to see that the causes for these more or less disastrous fires do not exist on their premises.

A late number of *Stove and Hardware* gives a list of fires which have recently occurred from this cause.

In a manufactory of plane bits in Chicago, a sponge had been used to transfer the water by capillary attraction from a water box to an emery wheel, on which the bits were ground. The sponge wiped off the fine steel particles from the wheel, and they were collected in the cells of the sponge, and kept constantly wet. The sponge was finally laid aside, and after a week or ten days it was discovered that the mass was spontaneously ignited, and if it had not been for its timely discovery another mysterious fire might have resulted.

In a factory in New Jersey where oiled stock for planes was operated on by boring, planing, and mortising machines, causing shavings and fine particles of wood, which were saturated with linseed oil, to collect on the floors, it was noticed that a great increase in the temperature took place when the sweepings—which had been moistened by sprinkling—were collected in a pile. On a subsequent occasion it was found that a barrel of shavings and chips from the boring and mortising machines were so hot as to be almost ready to ignite. Another barrel contained shavings made in planing oiled stocks. On these being moistened with water they soon began to heat, and the temperature continued to rise until the next day, when it was found that the shavings began to char. The barrel was covered with a metal plate until the next day, when, on being disturbed, the mass burst into flames.

A number of bales of Sea Island cotton stored in a warehouse in New Jersey were found to be on fire. When the fire was extinguished at one spot it would start at another. The cotton had been ginned on a roller gin, which, in cracking a portion of the seed, had caused the oil in the seed to become mixed with the cotton, and the result was spontaneous ignition.

In the manufacture of a cement or putty composed of whiting and boiled linseed oil, which, after being ground in a mill, was put in barrels, a fire was discovered under one of the barrels standing on end. The floor was partially burned through when the discovery was made. In grinding the oil the mass became warm from the friction, and a small part of the oil had leaked through the common barrels while in this warm state. It was discovered in time to prevent much damage.

An engineer placed a bunch of waste—which had collected in cleaning up a mill—in front of a boiler, in order that the fireman could use it the next morning in starting up the fire. During the night it spontaneously ignited, set fire to the kindlings which had been made ready for the morning, raised steam sufficient to blow off and alarm the watchman.

Some years since a gentleman was experimenting in coloring Southern moss for decorative purposes. In one of his experiments he used a very thin paint or varnish, but slightly colored with a pigment. He dipped the moss in the mixture, and then squeezed out as much as possible by hand. The result not proving satisfactory, he threw the moss in a box and placed it in a closet. A few days after, the odor of something burning led to the discovery that the moss was charred, and almost ready to ignite.

THE OLD ERECTING SHOP.

A SCIENTIFIC TOY.

The toy shown in the subjoined figure, taken from *La Nature*, although far from new, is nevertheless ingenious, and cleverly modernized by the constructor. This is the way to make the oracle speak; we will afterward give the secret of its accurate answers. We write upon 12 prepared cards a series of questions relating to history, geography, science, customs, etc. One of the company takes one of these cards at random and reads one of the questions; then the card is placed under the magician's feet, in a groove made to receive it. Immediately the oracle turns on its axis, and after some oscillations becomes fixed in a certain position, its magic wand pointing to one of the numbers by which it is surrounded. On referring to the corresponding number on a list, we read an admirably exact and accurate answer.

We may see that by varying at will the cards of questions and answers we may obtain from the oracle an indefinite number of replies. Nothing could be simpler than the process by which this result is obtained. The base of the toy, into which the cards slip, bears a vertical pivot on which rests the body of the magician, whose robe conceals a vertical U-shaped magnet, having its two poles near the base, as shown in Fig. 2.

In each of the cards there is another magnet concealed, a straight rod, occupying a different position for each of the 12 cards. We see that in virtue of the well known laws of the attraction of magnets for each other, each time that a card is placed with its magnet in the base, the figure will turn round this axis and effect a series of oscillations round its own axis until the poles of the U-shaped magnet holder under its robe are opposite the contrary poles of the straight rod hidden in the card. If the base has been correctly marked previously, the divining rod will indicate the corresponding number of the answer. Any boy with a little genius and a few tools can make an oracle similar to our engraving.

Fig. 1.—THE MAGNETIC ORACLE.

The Cannon Ball in Therapeutics.

It is a very self-evident proposition in physics that a cannon ball, as ordinarily propelled, will, upon its abdominal impact, produce a movement of the bowels. Such a movement, however, is attended with the serious personal inconvenience of producing a large hole in an important portion of the economy. And it is not in this way that Dr. H. Sahli, of Bern (*Correspondenz-Blatt fur Schweizer Aerzte*), proposes to utilize the cannon ball in therapeutics. He advises that it be simply rolled about upon the abdomen for five or ten minutes daily, in order to relieve habitual constipation. The weight of the ball should be from three to five pounds. In cold weather it can be covered with chamois or kept warm by the stove. Better still, according to Dr. Sahli, is the plan of having the patient take it to bed with him at night, and thus letting the missile of war warm itself ingloriously in the arms of the victim of colprostasis. The best time to use the cannon ball is in the morning after waking. It is then to be made part of the morning toilet; the patient lying on his back in bed rolls his ferric bedfellow systematically over the abdomen. The direction is not of so much importance as that of systematically treating every part of the abdominal wall. Abdominal massage is acknowledged to be a useful measure in torpidity of the bowels, and Dr. Sahli assures his readers that by his method he has been able to cure nearly all of his cases without the aid of medication. Of course proper attention should be paid to diet and hygiene.

When universal peace comes, the orator can speak not only of turning swords into plowshares, but also of cannon balls into aperients; while of Dr. Sahli it may be written: "Peace hath its victories, no less renowned than war."—*The Medical Record.*

Secure the Loose Joints.

The *Master Mechanic* thinks that engineers pay too little attention to the necessity of securely fastening the flexible parts in moving machinery that are liable to vibration. Such parts act like a cutting instrument, and eventually wear into each other and into the permanent structure. Not long since a locomotive could be seen, built by a builder of some reputation, where the cab sheet, not being fastened to the boiler, had cut about half way through the wagon top, almost rendering the boiler dangerous, and yet this locomotive had been built only a few years. The excessive noise about cars and locomotives renders the squeak and noise incident to such wearing unnoticeable. It therefore escapes attention until the damage is done. Often under new cars one can see loose rods bearing upon stay rods and trusses, without sufficient fastening to firmly hold them from vibration. If the louder noises and sounds about cars and locomotives could be silenced, the magnitude of the squeaking and grating sounds would be surprisingly apparent.

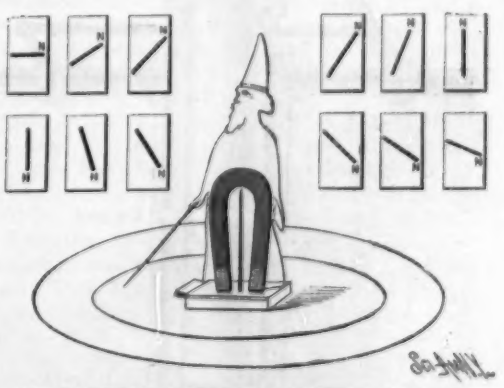
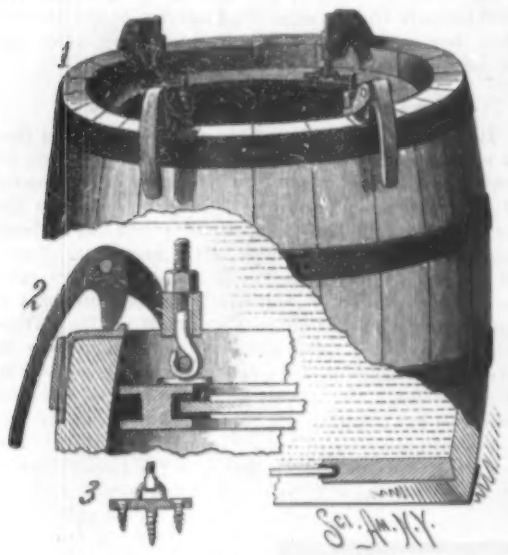


Fig. 2. DETAILS OF THE MAGNETIC ORACLE.

AN IMPROVED REMOVABLE BARREL HEAD.

An efficient barrel head and fastening, which may be locked air and fluid tight in the barrel, the barrel having a smooth inner face where the head fits it, is shown herewith, and has been patented by Mr. Robert C.

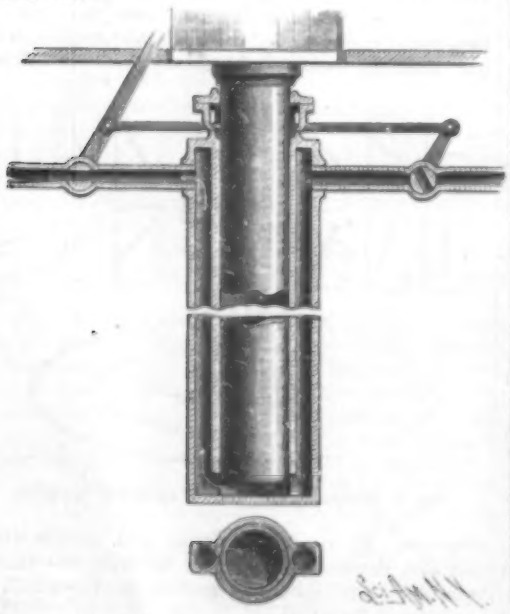


BOEKLER'S BARREL HEAD AND FASTENING.

Boekler, of Mankato, Minn. A removable barrel head is made with an outside frame or rim of wood or metal, with packing fitted in a groove in the outside edge of the frame to bear on the dressed staves, the inner edge of the frame being grooved all around to receive a glass or other transparent plate, with an interposed packing. The head is held to the barrel by cam lever clamping devices, their attachment being shown in section in Fig. 2, a lever with a cam head being pivoted to a link which has at its inner end an eye through which passes loosely the threaded end of an eyebolt, the loop or bent end of which incloses a cross bar or staple of a fastening plate, screwed or otherwise fastened to the upper face

NICHOLS' SLEEVE STAY.

of the barrel head frame. Fig. 3 shows another form of plate for holding the cam clamp. To prevent the toe of the cam lever head from indenting the end wood of the barrel stave, an angular metal plate is let into the stave to form a stop. By adjusting the nuts on the threaded end of the eyebolt connected with the link pivoted to the cam head, any required purchase may be given the levers to assure their effective operation in drawing the head tightly to place. With this construction there is no metal necessarily exposed to rust or corrode, and when the head is removed there is no flange, groove, or rabbet left in the barrel to hinder the free discharge of its contents and thorough cleaning of the barrel.



McDONALD'S HYDRAULIC ELEVATOR.

AN IMPROVED AIR SHIP.

A vessel for aerial navigation, which is designed to be a light and yet strong and roomy structure, capable of easy ascension and being readily steered, is illustrated herewith, and has been patented by Mr. Charles H. Morgan, of Gunnison, Col. It is constructed with a series of longitudinal tubes, adapted to hold concentrated gas, and bent to assume a generally spherical shape. These tubes are secured at their extremities to reduced end ribs, and to transverse circular or oval ribs, between which and the longitudinal ribs is an inner inclosing silk or metallic wall. An outer smooth metallic wall is also provided, having a sharp forward point, in which is a sight opening, a steering apparatus being mounted near by. In the central portion of the ship is a compartment, in subdivisions of which are electric motors to furnish propelling power, the wings being designed to partake somewhat of the appearance of a bird's wing, the upper row of wings propelling the ship forward and slightly upward, while the dip and stroke of the wings may be adjusted within certain limits. The rudder is made somewhat in the shape of a fish tail, and consists of two fans arranged side by side in the same plane. The ship is elevated principally through the introduction of the concentrated gas in the longitudinal tubes into the gas chambers, and ascension may also be facilitated by exhausting the air from other small chambers, and filling them with gas, while the ship may be lowered by external valves arranged with connecting cords within easy reach. The strength and character of the walls allow for great expansion of the gas, and automatically working valves are arranged to accommodate the varying internal and external pressures in upper and lower strata of air.

AN IMPROVED SLEEVE HOLDER.

A simple device for holding a sleeve in place on the arm when another sleeve is being drawn over it is shown herewith, and has been patented by Mr. Fred H. Nichols, of No. 24 Market Street, Lynn, Mass. It consists of a string or tape having a ring or loop fastened at one end, through which the tape freely passes, the other end being fastened to the tape adjacent to the ring. With this holder an adjustable loop may be readily formed at either end of the folded tape and drawn tight upon an arm, when, after holding the sleeve in position until the garment has been drawn over it, the hold is readily released.

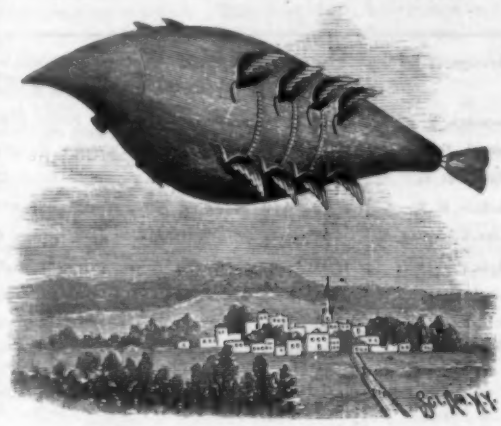
AN IMPROVED HYDRAULIC ELEVATOR.

A hydraulic elevator, in which water is used as a motive power, has been patented by Mr. John S. McDonald, of No. 42 Decatur Street, New Orleans, La., and is illustrated herewith, the larger view showing a longitudinal sectional elevation and the smaller one a plan view midway through the cylinder. In a cylinder which is closed at the bottom and open at the top operates a plunger, supporting the carriage on its upper end, outside the cylinder. On the sides of the cylinder are two channels, connected near their upper ends with the water inlet and outlet pipes, each having valves connected with each other by a single rod, so that they are operated simultaneously to close one and open the other. The lower ends of the side channels have openings into the bottom of the cylinder, the plunger, when in its lowest position, resting a short distance above the bottom, so that the openings are never closed. As water enters the inlet valve, the outlet valve being then necessarily closed, it passes by one of the side channels to its opening in the bottom of the cylinder, thus operating to raise the plunger, with its load. When the plunger reaches its extreme upper position, by the reversal of the valves, closing the inlet and opening the outlet pipe, the downward movement commences, the weight of the plunger, its carriage and load, forcing the water from the cylinder, through the outlet pipe, with a strength of current sufficient to carry away any sediment it may have contained. The side channels are in this way so connected with each other, through their bottom openings into the cylinder, as to make a passage in which the sediment is prevented from settling, but will be carried out by the rush of water each time the cylinder descends.

A METHOD AND APPARATUS FOR HEATING CARS.

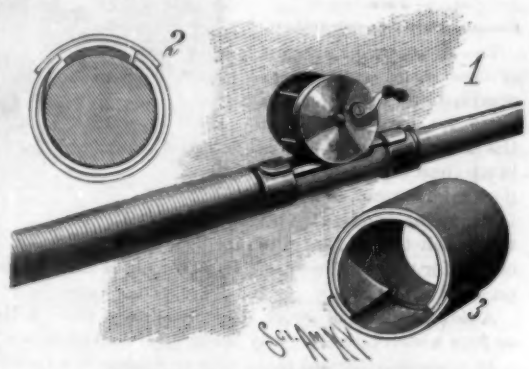
An improved method and apparatus for heating cars by utilizing the waste products of combustion, conveying them beneath the cars of a train, and supplying air heated thereby to the interior of the cars, is illustrated herewith, and has been patented by Mr. Thomas R. White, of No. 33 Wellington St., Boston, Mass. A hand lever in the cab of the locomotive is connected with a lever pivoted in the smoke box, which controls a double damper, whereby the products of combustion may be directed through an aperture in the bottom of the smoke box, and thence through a jacketed flue consisting of an inner and outer pipe extending beneath the locomotive and cars, or said products may be allowed to escape through the smoke stack in the regular way.

Two blowers are mounted in the locomotive cab, operated by a small engine, and when sufficient steam has been raised by the natural draught of the fire, with



MORGAN'S AERIAL SHIP.

the usual opening to the smoke stack, and it is desired to divert the products of combustion into the jacketed flue, the double damper is turned, and one blower operated to supply a forced draught to the fire while the other supplies air to a pipe which surrounds the one carrying off the products of combustion under the cars. These pipes extend longitudinally beneath each car of a train, and are adapted to be coupled to each other and to the pipes of the engine in any suitable or approved manner At regular intervals smaller semicircular pipes are made to radiate from each side of the outer longitudinal pipe, as shown in the small figure, and pass up through the floor of the car, through a suitable register. Upon the outer end of the longitudinal pipes, at the rear of a train, is fixed a screen through which the smoke and gases pass off, the ashes and cinders dropping through an aperture in the under side of the tube. By this means the heat ordinarily wasted and passing off through the smoke stack is

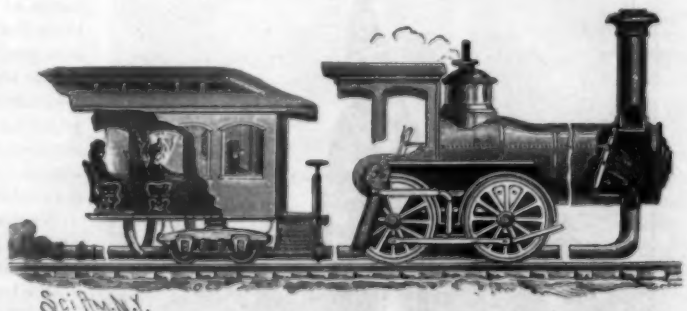


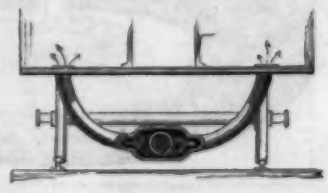
PRITCHARD'S WEDGE FERRULE.

utilized to heat the air supplied to the cars, fresh air being constantly forced through the outer tube by one of the blowers. The smoke and cinders from the engine, ordinarily so great a discomfort in traveling, and frequently necessitating the closing of windows and ventilators, will be, by this method, carried to the rear of the train, so that they cannot be of any annoyance to the passengers, and the danger of fires caused by locomotive sparks will be removed.

WEDGE FERRULE FOR FISHING-ROD REELS.

A simple and effective device for readily and securely attaching a fishing reel to a rod is shown herewith, and has been patented by Mr. Henry Pritchard, Fig. 1 showing the device in use, and Figs. 2 and 3 sectional and perspective views of the wedge ferrule. The ferrule has the usual recess for the reception of one end of the





WHITE'S CAR HEATING APPARATUS

reel bed plate, the recess being formed by cutting away a portion of the body of the ferrule and covering the opening with a cap. A

strip secured to the inner face of the ferrule extends from edge to edge of the recess, the strip being preferably rectangular in cross section, except that at one end it is cut away upon a double incline. After the reel bed plate has been introduced, by turning the ferrule, the double inclined face of its strip is brought to bear against that edge of the upper face of the bed plate that is beneath the ferrule, the strip acting to wedge the bed plate firmly to the rod and preventing all longitudinal as well as lateral motion of the bed plate.

For further information relative to this invention, address Messrs. Abbey & Imbrie, 18 Vesey Street, New York City.

Paris as a Seaport.

In answer to a series of questions drawn up by the Minister of Public Works, the Societe Civile des Etudes de Paris de Port de Mer, the president of which is Admiral Thomasset, has drawn up a report which is most interesting. It may be stated that the Society was formed to carry out the project of M. Bouquet de la Grye, a member of the Institute. This project solves the problem of the canalization of the Seine by means of a canal in the bed of the river having a minimum depth of 6 20 meters and a width sufficient to allow of two large vessels passing each other in contrary directions without danger and without slackening speed. It is the only project regarded by M. Guichard, reporter of the sixth municipal commission, as feasible and likely to settle a question of so much interest to Paris and the whole of France. By those competent to judge, the plan has been regarded as comparatively inexpensive and easy of execution. As to the advantages offered in perspective, they will be best appreciated when we say that the cost of transport of the freight of a sea-going vessel from Rouen to Paris will be reduced one-half, that the voyage can be made in seventeen hours, that the vessels will be able to steam by night as well as by day, the canal being lighted by electricity, and that the whole undertaking will only require three years for its completion.

A few figures may be here given as proof of its economy. Let us take as an example a vessel of 1,000 tons coming from the sea. Its freight is bound for Paris, but its draught of water forces it to discharge at Rouen into barges. This would cost 500 francs per day for the location and maintenance of a vessel of 1,000 tons. This stated, it is easy to show the cost of two vessels of that tonnage; one transhipping its freight into barges at Rouen for transportation to Paris, the second going straight on to Paris without stopping at Rouen. The figures are as follows:

	Francs.
Two days employed in disembarkation at 500 fr. per day	1,000
Expenses of transhipment	800
Rights of tonnage at Rouen	550
Transport from Rouen to Paris per barge	7,000
Total	9,350

Vessels going direct to Paris:

Duration of the voyage, 17 hours (one day)	500
Discharge into wagons at the quay	750
Length of time of discharge, one day	500
Canal dues	3,000
Pilotage dues	50
Total	4,800

These figures showing, therefore, a saving of nearly 50 per cent, which for a number of industries is a serious consideration. The canalization of the Seine is of vital importance to French commercial prosperity and the defense of the country. The report already mentioned concludes as follows:

"Our honest enemies, instead of seeking to enter France by forcing the entrenched camps and the fortresses which we have built at Belfort and in the Ardennes, cynically violating neutral countries, intend to enter Belgium, thence to advance upon Paris. In these circumstances, it is evident that the Seine would become of major importance. To excavate the canal to a depth of 6 20 meters, immense quantities of earth would have to be taken therefrom, and the author of the project, M. Bouquet de la Grye, has seriously considered how to dispose of that earth. Among other uses to which it might be put is the erection of small forts, which, built on the right bank, and armed with field guns, would interdict the entry of the river to the Germans, while day and night ironclads and torpedo boats would cruise up and down, thus rendering the passage impossible. It would then become necessary for the Germans to make themselves masters of Rouen before advancing upon Paris. As to the food supply of Paris, on the declaration of war the necessary flotilla would be able to continue its services without fearing the intervention of the Germans, protected as it would be by the ironclads and the forts on the right bank of the canal. From another point of view, we have already stated that the canal would be of importance to Parisian commercial interests. The Paris merchant is satisfied at present with drawing his supplies from Rouen and Havre, without troubling whence they come in the first place. It will be different when, placed in communication with the original shippers, he will appreciate the advantage of doing without burdensome middlemen. He will be induced to study commercial geography, which would lead the way to his becoming a real merchant, and perhaps eventually a shipowner himself."

We take the foregoing from *Engineering*, and have but this comment to add: When this ship canal is extended to Paris, it would not be very much of a job to carry it completely around the city, and then a constant patrol of ironclads and torpedo boats could be maintained as above described, and the Parisians might laugh at the terrible Germans. The question now is, Can the French keep quiet until the canal is constructed?

IMPROVED FIRE EXTINGUISHER FOR CAR HEATERS.

A simple device for extinguishing fires in car heaters, when the latter are upset by collision or other accident, is illustrated herewith, and has been patented by Mr. Edward Maguire, of Lemont, Cook County, Ill. A tank is supported by suitable braces above the heater, the tank having a false bottom and a lower perforated bottom, and holding, above the false bottom, a fire-extinguishing liquid. From an aperture in the center of the perforated bottom a flexible tube leads to the fire box of the heater, and in the center of the false bottom is an opening adapted to be closed by a plug or stopper, to the upper end of which is attached a wire or cord, extending upward through the top of the tank, over a pulley in the car roof, and having its outer end secured

MAGUIRE'S CAR HEATER FIRE EXTINGUISHER.

to the heater. Another cord from the stopper in the false bottom is extended over the pulley and along the side of the top of the car, its end hanging down in convenient reach of the passengers. An accident sufficient to overturn the heater would cause the stopper to be withdrawn from the opening in the false bottom, thus allowing the fire-extinguishing liquid to flow into the fire box, and to be distributed around the heater from the perforated bottom of the tank, or, if there were danger of the heater setting fire to the car when not upset, the stopper could be withdrawn and the extinguishing liquid allowed to escape by means of the other cord extending along the side of the car.

"Wind and Weather Permitting."

This condition, painfully familiar to the last generation of travelers by sea, but almost forgotten since the days of steam power afloat, ought to be adopted as a general provision by all who are not of the very strongest and healthiest type of humanity, in respect to out-door engagements at this most trying season of the year, more particularly in large cities. A glance at the obituary column in any leading newspaper will suffice to prove that the risks of life, especially to the weakly and the aged, at this season of the year, are out of all proportion to the apparent natural vicissitudes of the spring. The truth is, that the changes of personal temperature are so sudden and severe that few constitutions can suffer them with impunity. What we mean by personal temperature is this: The atmosphere generally may, as shown by the thermometer, be fairly mild, or at least not remarkably cold, but owing to the strong currents of icy wind which rush through doors and under archways, out of courts and alleys, round corners and across main thoroughfares from side streets, a pedestrian not able to bear being almost instaptaneously deprived of a large proportion of his caloric, and endowed with such vigorous powers of heat production as to be able to compensate for the loss with extraordinary rapidity, must in a walk of very short duration be thoroughly chilled. Take, for example, says the leading medical journal of London, the *Lancet*, any ordinary main street in that great city, of some quarter or third of a mile in length. It will probably have fifteen or twenty side streets on each side; so that, unless the wind chance to blow parallel with the main thoroughfare, a person walking through it will encounter, say in twenty minutes, fifteen or twenty blasts of cold air, which will catch him suddenly. Each of these blasts will do two things to him. First, it will rapidly take from his body as much heat as can be abstracted in the period occupied in crossing the side street, which is considerable; and, secondly, it will give an appreciable depressing shock to the nerve centers through the nerves of the skin. These fifteen or twenty successive abstractions of heat and nervous depressions, following each other at intervals of a minute or a little over, will produce an aggregate impression on the vital state—that is, the heat and the energy of the organism together—at the end of the twenty minutes which cannot fail to be felt by a weakly or susceptible person. There is no time to recover between the attacks. When a man takes his bath in the morning, he gets a reaction following the depression of the chill; but if he no sooner got out of one bath than he plunged into another, instead of benefiting his health, the "tubbing" would do him harm. It is far worse for the pedestrian to walk along such a main thoroughfare as we have supposed than it would be for him to walk on a cliff exposed to the steady blow of the same wind. The organism can much more readily accommodate itself to a prolonged low temperature, if it be not a crippling cold, than it can sustain without injury a rapid succession of little chills and shocks. These are like the rain of knock-down blows that exhausts the boxer. He has no time "to get breath" between the attacks of his opponent. We have not exaggerated this matter, and we venture to think it is one which the dwellers in cities will do wisely to bear in mind. It is often difficult to tell how a "cold" has been "caught;" but this we know too well, that what seem to be very slight colds are often productive of the most serious results. It is not heroic, but rash, to risk taking cold. The most robust and apparently the strongest may succumb to the consequences of such an attack. Healthy and hardy country folk, and even mountaineers who "live in the open," frequently take cold in some large city. It is the fusillade of deadly little chills they cannot bear, and it is this exposure which produces pneumonia, so prevalent at this time of year.

Francois Lacharme.

The announcement of the death of this celebrated rosarian will be received with great regret, as few men have done so much in the improvement of the rose. He was born on the 28th of January, 1817, at St. Didier sur Charony, Aix, France, and died at Lyons. His father was an agriculturist, and wished his son to follow the same business, but at an early age the roses in his father's garden had already inspired him with a desire to become a cultivator of them. At last his father yielded to his desire, and apprenticed him to M. Poncet, a horticulturist at Lyons, where he made the acquaintance of M. Plantier, the well known rosarian, who advised him to go to Paris, and gave him an introduction to M. Pirolle, the founder of the "Bon Jardinier." This gentleman obtained him a situation in a large horticultural establishment in the neighborhood of the Palace of the Luxembourg, where M. Hardy, a great amateur of roses, was director of the gardens. In 1840, M. Plantier, desirous of retiring from business, offered M. Lacharme his rose establishment, which he accepted, and returned to Lyons. He soon began to cultivate roses, and, assisted by M. Plantier's advice, he quickly obtained a very fine variety, which he called Madame Ernestine de Barante. It was one of the first hybrid perpetuals, and was sent out in 1843. From that date he continued to raise seedlings, and with great success, as nearly all of them are still in collections of roses.—*The Garden.*

Bridge Travel between New York and Brooklyn.

A recent test made by the bridge management of the number of passengers crossing the structure by hours shows that, from 12 M. to 1 A. M., of a Tuesday morning, 389 passengers crossed from New York to Brooklyn, while 197 went from this side to New York. From 1 to 2 A. M., 249 came from New York and 62 went from Brooklyn. From 2 to 3 A. M., from New York, 211; from Brooklyn, 80. From 3 to 4 A. M., from New York, 111; from Brooklyn, 128. From 6 to 7 A. M., from New York, 469; from Brooklyn, 2,894. From 7 to 8 A. M., from New York, 841; from Brooklyn, 9,366. From 8 to 9 A. M., from New York, 712; from Brooklyn, 10,068. From 9 to 10 A. M., from New York, 1,087; from Brooklyn, 4,589. From 12 to 1 P. M., from New York, 1,345; from Brooklyn, 1,618. From 3 to 4 P. M., from New York, 2,109; from Brooklyn, 1,897. From 5 to 6 P. M., from New York, 9,402; from Brooklyn, 1,580. From 6 to 7 P. M., from New York, 8,519; from Brooklyn, 1,121. From 7 to 8 P. M., from New York, 2,251; from Brooklyn, 1,402. From 8 to 9 P. M., from New York, 1,373; from Brooklyn, 652. From 9 to 10 P. M., from New York, 1,314; from Brooklyn, 562. From 10 to 11 P. M., from New York, 1,211; from Brooklyn, 667. From 11 to 12 P. M., from New York, 1,307; from Brooklyn, 480. The total number of passengers during twenty-four hours was 91,130.—*Brooklyn Eagle.*

FRICTION DRIVING GEAR FOR DYNAMOS.

We illustrate herewith two fine sets of electric light machinery constructed by the Anglo-American Brush Electric Light Corporation, Limited, of London, under the patents of Mr. J. S. Raworth, their superintending engineer. The dynamos are of the Victoria Brush type, and are driven by friction gear after a manner which has been successfully adopted in nearly two hundred large installations. The essential feature of this gear is that the dynamo is hung in a cradle which permits it to respond to the action of the screw which puts the grip on the friction wheels, without putting any extra pressure on the bearings of the armature spindle. The friction pinion is made of compressed paper, and runs in contact with a large cast iron wheel, which also acts as the fly wheel of the engine. The pressure between the two surfaces is obtained by screwed rods, seen at the left hand of the figures. These rods connect two gun metal bearings, which are applied to extensions of the crankshaft and of the armature spindle. Thus the strains due to the pressure between the frictional surfaces are practically confined to the two exterior bearings, and as these are not connected to the framework of either engine or dynamo, their wear does not throw other bearings out of line.

The engine in one illustration has a cylinder 8 inches in diameter by 8 inches stroke. The valve chest is at the back of the cylinder, and the valve is worked through a rocking shaft, this arrangement allowing the engine and dynamo to be included within a length of 5 feet 6 inches, and thus rendering it applicable in very confined spaces. The engine shown in the other view is of Raworth's compound high speed type. It has cylinders 7 inches and 12 inches in diameter by 8 inches stroke, working on two cranks set 180 degrees apart, so that the pistons and connecting rods balance each other. There is a single bearing between the two cranks, the second bearing of the shaft being at a considerable distance, close to the fly wheel. As the two cylinders balance each other, the stresses on the cranks are equal, and consequently there is but little friction on the intermediate bearing, the engine running very light in consequence. The low pressure valve chest is seen in front, that of the high pressure cylinder being behind the governor.

These two sets of electric lighting machinery were exhibited at Manchester, and attracted a large amount of attention. They are designed to feed 140 and 300 lamps respectively, and are specially distinguished by their compactness and lightness. On shipboard they have been very successful, and have met with the warm approval of sea-going engineers, who find some of the high speed engines difficult to understand and impossible to keep in satisfactory order. The engines work with a small expenditure of fuel, and are provided with ample bearing surfaces and the most perfect lubricating appliances, so that they can run for days together without a stop, either for oiling or for setting up the brasses. In land installations, particularly those in London clubs and hotels, the small space occupied by this plant often renders it possible to introduce electric light when otherwise it would be inadmissible, while the directions of the motion and its high efficiency secures for it the approval of those who delight in a neat and workmanlike piece of machinery.—*Engineering.*

Our Ships and Railways.

Ever since the birth of the republic it has been illegal for the vessels of any foreign power to engage in our coasting trade.

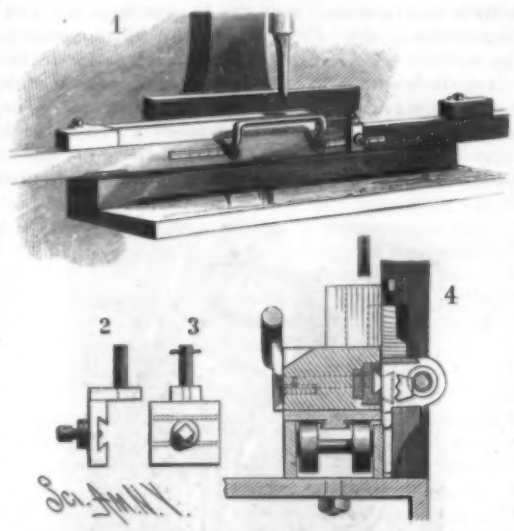
Why should it not be speedily made illegal for the Canadian railroads to engage in carrying goods and passengers between our Eastern and Western cities?

The cases are exactly parallel. If we protect our ships against the competition of foreign ships, why shouldn't we protect our home railroads against those running just outside of our northern borders? Let Congress think about this.—*N. Y. Sun.*

[We have an inter-state law intended to suppress the old railway practice of transporting freight for long distances at less rates than were charged for short distances. But at present this law is in part nullified by railway connections with the Canadian roads, by which cheaper rates are obtained *via* Canada between certain parts of the United States than by our own direct lines.]

IMPROVED ATTACHMENT FOR MORTISING MACHINES.

An attachment designed to be held on the top of the table of a mortising machine of any approved construction, to facilitate the accurate forming of a mortise at each end of a piece of wood, is shown herewith, and



BULLIS' ATTACHMENT FOR MORTISING MACHINES.

has been patented by Mr. Henry M. Bullis, of Traverse City, Mich. The bed of the attachment, which is fastened to the table, is provided with rollers, which support a sliding carriage on guides, each of which has in its middle a longitudinally extending dovetail fitting into a corresponding groove in the transverse partitions shown in the cross section, Fig. 4. In Figs. 2 and 3 are shown end and side views of a sliding block for supporting a rest. An upward motion of the carriage is prevented by the dovetail, and its longitudinal movement, by the operator taking hold of the handle, is limited by guide blocks secured to the inner ends of dovetailed strips sliding in a dovetail groove extending the length of the carriage at the rear. Guide blocks carry a rule to indicate the length of the stroke of the carriage or the length of the mortise to be made, and in the groove in the rear of the carriage are adjustably held dovetailed graduating strips, on each of which is held to slide a block on which is fastened a rest held on the top of the carriage. The wood to be mortised is placed on top of the carriage, with its outer end against the rest and its rear against the face of a guide, the inner end of the wood directly under the mortising tool, the rest being set so that when the attachment is in the position shown in Fig. 1 the mortising tool is at the extreme outer end of the mortise to be formed. The mortising machine is then set in motion, the tool operating on the wood, and the operator moving the carriage by the handle in either direction, first forming the mortise in one end and then in the other. Each operation makes a mortise half through the timber, when the wood is turned over and the stops on the other side of the attachment are used.

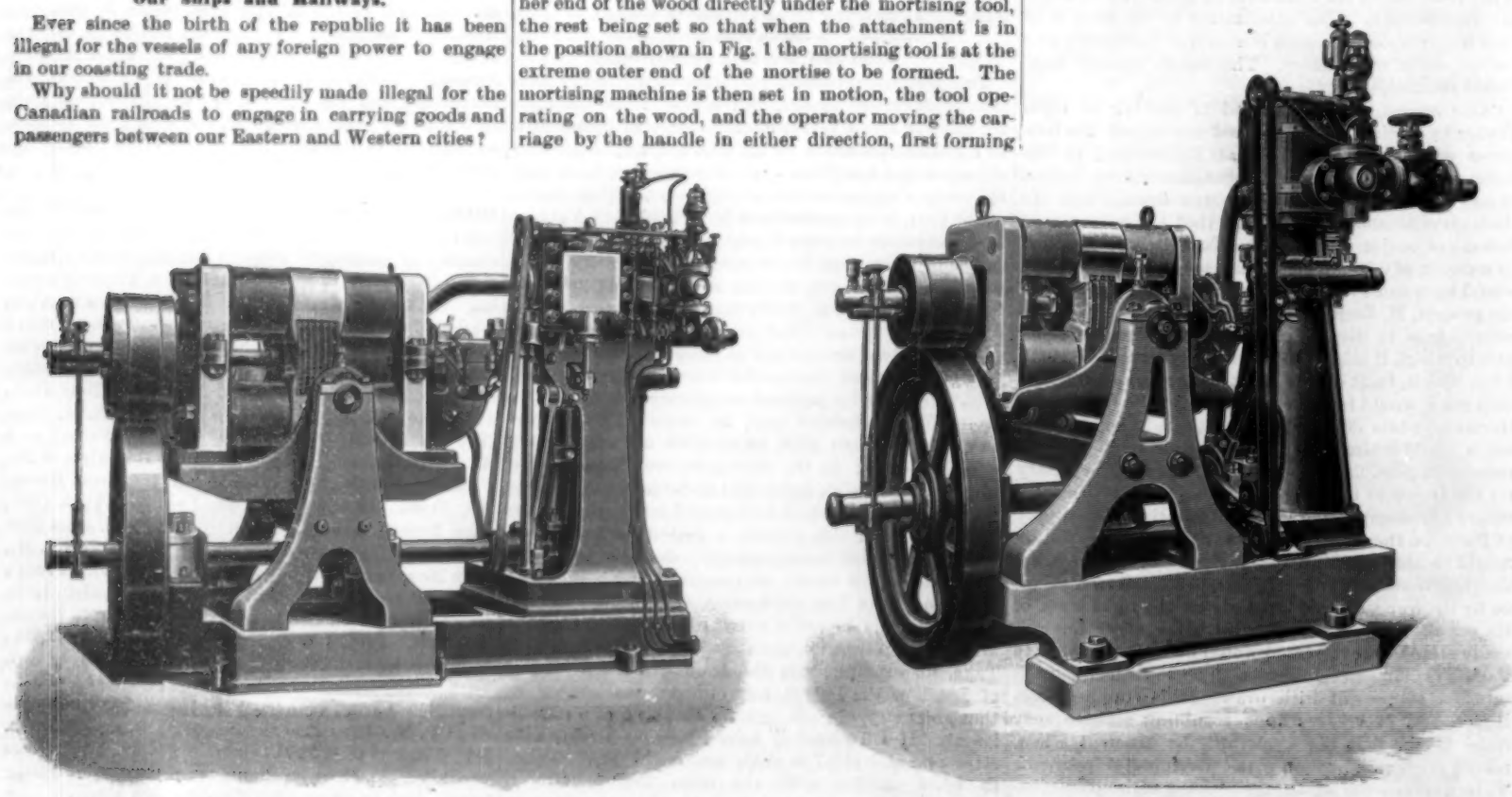
Using up the Scraps.

The utilizing of materials formerly wasted has been frequently referred to in these columns, and a long list of the articles made from such waste specified. The *Baltimore Sun*, referring to this subject, mentions three waste materials now utilized in that city:

"Every resident," the writer says, "can recollect the immense piles of waste tin from the can shops that used to glitter in the hollows of East Baltimore and upon every dump in that section a dozen years ago. The first use of this waste was by a poor man from the North, who obtained permission to set up a machine in Smith & Wicks' can shop in this city. Here he bought scraps for almost nothing, and cut out tin button stock to send East. Afterward the stamps for shaping the buttons were introduced, and the individual reaped a large fortune from his enterprise. The next use of tin scrap was for smelting. The tin at first refused to flow when subjected to the heat of the furnace. It was discovered that it would pay to cut the tin coating chemically, and that the sheet iron would then smelt and flow. Out of this grew the manufacture of sash weights, and few of them are now found that are not made from tin scrap. Several foundries use all that is made. The scrap was pounded into wads by stamping it in large buckets.

"A most interesting feature of all businesses using leather is that not one particle of the leather is wasted. Our shoe factories alone sell annually fifty tons of waste. This goes mainly to a firm in Philadelphia, who pay $7 a ton for it. A large amount is sent to Lynn, Mass., and other points, where the leather is ground up, mixed with a medium, and pressed into buttons. The remainder that is not so used is treated chemically, turned into a gelatinous mass, dried, and ground into a fertilizing dust. The sole leather pieces that fall from the block of the heel stamper are sorted into two heaps. The very fine pieces are put with the fine waste. The scraps, presenting a surface of a couple of square inches, are barreled up and sold to parties in New York or Boston at one cent a pound, where they are put through a peculiar machine. This instrument splits the pieces nearly through. Then it opens the piece thus cut like a book. Thence it is delivered from between rollers, and is large enough to be again sent to the factory to be cut up into heel lifts.

"There is another small but important industry which goes to prove how ordinary wastes of business may be turned to account. This is a work of long standing, though not generally known. In every photograph gallery there is annually a large amount of waste silvered paper. This is all thrown into a box and is bought or exchanged for nitrate of silver. The comparatively small amount collected in one gallery aggregates a great mass when all the galleries are considered. This paper is burned, and the silver that is extracted from the residue pays sufficiently at least for a good living. The time was, not very remote, too, when the coal tar from gas houses was a nuisance in every harbor. Now every bit of the tar is utilized, and some of the finest dyes ever known are made from it."



FRICTION DRIVING GEAR FOR DYNAMOS.

FERDINAND VANDERVEER HAYDEN.

BY M. B.

Of the great surveys of the United States prior to the creation of the present United States Geological Survey, that established in 1869, under the direction of the distinguished scientist whose name stands at the head of this sketch, was undoubtedly the best known, most important, and longest in point of duration.

Ferdinand Vanderveer Hayden was born in Westfield, Mass., on September 7, 1829. He early moved with his parents to Ohio, and settled on the Western Reserve, where he was brought up on a farm and studied at common school, but he received an excellent education, for he was graduated at Oberlin College in 1850, and then turning his attention to medicine, received his degree in that science at the Albany Medical College in 1853.

During the same year he began his career as a geologist, and was sent by James Hall, then and still State geologist of New York, to the Bad Lands of Dakota, where he explored one of the remarkable ancient deposits of extinct animals, and returned to Albany with a large and valuable collection of fossil vertebrates. In 1854 he againt went West under the auspices of the American Fur Company, but at his own expense, and after spending two years in exploring the basin of the Upper Missouri River, returned with a large number of fossils, part of which he deposited in the St. Louis Academy of Sciences and the remainder in the Academy of Natural Sciences in Philadelphia. On his return, in February, 1856, he was employed by Lieut. Gouverneur K. Warren, of the U. S. Topographical Engineers, to make a report on the district he had just explored, and so secured to the government the results of his three years' work.

His collections attracted the attention of the authorities of the Smithsonian Institution, and in May, 1856, he received the appointment of geologist on the staff of Lieut. Warren, who was engaged during 1855-57 in making a reconnaissance of the Northwest, principally in what is now known as Dakota

Dr. Hayden continued so occupied until May, 1859, when he was appointed naturalist and surgeon to the expedition sent out for the exploration of the Yellowstone and Missouri Rivers, under Captain William F. Raynolds, of the United States Engineers. He was engaged in this work until May, 1862, when, the civil war having broken out, he was appointed acting assistant surgeon, and assigned to duty at the Satterlee Hospital, in Philadelphia. On February 19, 1863, he was confirmed assistant surgeon and full surgeon by the United States Senate, and sent to Beaufort, S. C., in the capacity of chief medical officer. This place he filled until February, 1864, when he returned North, and was made assistant medical inspector in the department of Washington. In September, 1864, he was ordered to Winchester, Va., as chief medical officer of the Army of the Shenandoah, then commanded by General Philip H. Sheridan. He remained with this command until May, 1865, when he resigned from the army and was given the brevet of lieutenant-colonel for "meritorious services." In 1865 he was elected professor of mineralogy and geology in the University of Pennsylvania, in Philadelphia, and continued in the active administration of this chair until 1872, when the increasing duties of the geological survey compelled his resignation. Meanwhile, in 1865-66, he was unofficially connected with the Smithsonian Institution, and during the summer of 1866 he again visited the valley of the Upper Missouri, for the Philadelphia Academy of Natural Sciences, gathering for that society a valuable collection of vertebrate fossils. In 1867, when Nebraska was admitted as a State, Congress provided for a geological survey of the new State. The direction of this work was given to Dr. Hayden, who in 1868 extended his work westward into the Territory of Wyoming, and made two annual reports to the Commissioner of the General Land Office. For this work, the small sum of $5,000 was annually appropriated, and the present national survey is the direct continuance and outgrowth of this small beginning.

In April, 1869, this work was reorganized under the title of "The Geological Survey of the Territories of the United States," and for the first year's work $10,000 was appropriated. During the subsequent years until 1872, Dr. Hayden conducted a series of geological explorations in Dakota, Wyoming, Utah, and Colorado, the scope of investigation including besides geology, the natural history, climatology, resources, and ethnology of the region. The grants of money were likewise steadily increased from year to year, until, in 1873, they reached $75,000, and $90,000 for engraving. In 1886, the year in which Dr. Hayden severed his connection with the survey, it received $503,240, or over one hundred times the sum originally granted to the survey, nearly twenty years previously. In 1869, the work of the survey included a reconnaissance along the eastern edge of the Rocky Mountains from Cheyenne, Wyoming Territory, to Santa Fe, New Mexico, with reports of the geology and mining and agricultural resources of the country passed over; and in 1870 the area explored comprised a belt of country in Wyoming Territory along the line of the Union Pacific Railroad, and the annual report for that year contained papers on the geology, natural history, meteorology, agricultural and material resources of the Territory, besides special reports on its fossils, plants, fish, and reptiles.

A portion of the country at the sources of the Yellowstone and Missouri Rivers was explored in 1871, including the Yellowstone Lake, and the geysers and hot springs of the Fire Hole or Upper Madison River. Descriptions of the wonders of this region soon found their way into print and were translated into foreign languages. Public interest was developed to such an extent that during the sessions of Congress that winter an act, approved on March 1, 1872, was passed, by which the district now known as the Yellowstone National Park was "reserved and withdrawn from settlement, occupancy, or sale under the laws of the United States, and dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people," and placed under the exclusive control of the Secretary of the Interior.

In 1872, two parties were in the field. One division explored the headwaters of the Yellowstone, Gallatin, and Madison Rivers more in detail than in the previous year, while the other division visited the Snake River or Lewis Fork of the Columbia, in Idaho and Wyoming Territories—a region which before that time was only partially known; and in 1873 the work in Colorado was begun on the eastern front of the Rocky Mountains, and then carried westward, being completed in 1876.

Meanwhile, in 1873, geography was added, not as primary object, but for the sake of furnishing a topographical base on which the geological formation could be shown, and the name of the organization again changed, becoming "The Geological and Geographical Survey of the Territories." Thereafter the work progressed more systematically, and on the completion of the labors of the survey in Colorado, in 1876, the seat of action was again transferred to Wyoming.

In this manner the active direction of this important national undertaking was continued until 1879, during which year the existing surveys, including, besides that of Dr. Hayden, those under the supervision of Major John W. Powell, Clarence King, and Lieut. George M. Wheeler, were consolidated, forming the United States Geological Survey. This action was the result of considerable legislation, owing to the rivalry of the heads of the interior and war departments, each of which contended that the survey should be under his direction. In this movement, Dr. Hayden advocated the placing of the survey under the charge of the department of the interior, and was an active candidate for the directorship, but the choice fell upon Clarence King, who received his appointment from President Hayes.

Dr. Hayden was at once made assistant geologist, and given charge of the work in the region of the sources of the Mississippi or the division of Montana. He continued in this capacity until failing health caused his resignation, to take effect on December 31, 1886.

He was a member of scientific societies both in the United States and in Europe, and in 1873 was elected a member of the National Academy of Sciences. In 1876 the honorary degree of LL.D. was conferred on him by the University of Rochester, and in June, 1887, he received a similar degree from the University of Pennsylvania. On his receipt of the latter, the *Public Ledger* said: "It is a praiseworthy act for the University to honor with the highest distinction in her gift her justly distinguished son, and, as far as the recognition of his skill can do, to console his dying hours."

Dr. Hayden's scientific papers were about fifty in number, and were contributed to the *American Journal of Science*, to the *Proceedings* of the Philadelphia Academy of Sciences, and to the transactions of other learned societies of which he was a member. His principal publications were issued by the government, and included annual reports from 1867 to 1879, which give the general and geological descriptions of the region surveyed each year, together with special reports on the paleontology, natural history, and similar subjects, with catalogues of the specimens, also so-called miscellaneous publications designed to give information on various subjects of interest connected with the West, written by authorities in the specialties of which they treat, and finally a series of quarto volumes entitled "Reports of the United States Geological Survey of the Territories." To most of these volumes he was a contributor, and as United States geologist in charge of the survey, their editor.

In 1886 Dr. Hayden was stricken with progressive locomotor ataxia. This soon prostrated him, until he was confined to his room, and although he rallied slightly during the spring and summer of 1887, he continued to sink until death relieved him of his sufferings, in Philadelphia, on December 22, 1887.

J. V. Hayden

NATIONAL ACADEMY OF SCIENCES.

* Died in Philadelphia, Dec. 22, 1887.

The Dependence on Invention.

In the December number of the *Popular Science Monthly* appears a leading article on inventions at Panama. Nothing is truer than that all great undertakings are accompanied by inventions equal to their necessities. Especially is this true when anything of a great public benefit is in the balance. Inventions may not always be equal to the emergency immediately upon its development, but their evolution is sure till they are capable of overcoming the difficulty. The immense dredging apparatus and excavators at Panama have done wonderful execution, and have been greatly instrumental in sustaining the hope in the eventual success of the enterprise under its present management. But it would seem, from the reports coming from that quarter, that inventions have not been multiplied or developed enough to meet the urgency of the undertaking.

That a canal will eventually be cut through from ocean to ocean on the line laid out by De Lesseps is an event of as much certainty as that which followed the conception of the Suez Canal, if it is thought that the requirements of commerce will be advanced thereby. Physical obstacles have thus far been subdued by the engineering skill of man, in cases where they have at first appeared insurmountable. "Every great undertaking, properly conducted, brings about improvements in the processes of execution." This is exemplified in the tunneling of Mont Cenis and St. Gothard. To facilitate the progress of the work and make it more of a possibility, the invention of a machine for the compression of atmospheric air and its utilization as a motor became a matter of vital necessity. It aided in the prosecution of the work by keeping the air comparatively pure, while acting as a power in the operation of the drills. Had it not been for this contrivance, that the exigencies of the situation called into demand, workmen would have found it impossible of laboring in the vitiated air, or a great expense would have had to be incurred to accomplish several purposes, all of which this invention effected. This Alpine air pressure engine has not been used at Panama, as it is adapted only to tunneling or mining, but it serves to show that what man undertakes to do, that appeals to public necessity, he is sure to have the aid of invention to help in its final achievement. The great dredges at Panama were inspired by the difficulty of procuring labor. —*Boston Journal.*

To restore faded ink on parchment, etc., the Bodleian Library, at Oxford, has long employed solution of hydrosulphide of ammonia, which is spread in a thin layer over the writing with a camel's hair pencil.

Correspondence.

How to Clean Gauge Glasses.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of December 17 you recommend cleaning water gauge glasses with pine stick and cotton cloth swab. We have used the above, also soft cotton waste drawn through the tube, but find the best annealed Scotch glasses break in a short time after cleaning. We then used slightly diluted muriatic acid, which cleaned them nicely without using any solid substance in the aperture of the glass. The acid can be used a number of times, by keeping in a long necked bottle. In cleaning the glass, immerse in the bottle for a short time, wash in clean water, and replace in water column. I have used the above, and know it to be good. EDWIN S. LEIGH.

Clayton, N. J., December 19, 1887.

Lunar Photography.

To the Editor of the Scientific American:

Mr. Henry C. Maine, associate editor of the Rochester, N. Y., *Democrat and Chronicle*, and an enthusiastic amateur astronomer, has recently produced some photographs of the moon of very great excellence. The instrument used was a silver on glass reflecting telescope of thirteen inches aperture and seventy-eight inches focal length, of Mr. Maine's own construction. The image of the moon at the principal focus is about three-quarters of an inch in diameter, but in the latest photographs this image is enlarged to about 1¾ inches diameter by means of an amplifier or Barlow lens. A negative image is in this way secured directly of the above dimensions. The brilliancy of the focal image is so great that drop shutter exposures are possible, and the negative is very sharp and well defined. The writer recently had the pleasure of examining contact and enlarged paper prints of these negatives, and was surprised at the amount of detail shown therein. The enlargements were fifteen inches in diameter, and represented the moon at about the first quarter, and full phase, and reflect the highest credit upon Mr. Maine's skill and perseverance. They were recently used to illustrate a paper read by Mr. Maine, before the Rochester Academy of Science, on "Lunar Photography," which elicited great interest. WM. R. BROOKS.

Red House Observatory, Phelps, N. Y., Nov., 1887.

Remedy for Ivy Poisoning.

To the Editor of the Scientific American:

In your paper of November 5 you have an article on ivy poisoning. I beg a small space to give my personal knowledge of the effects of the vine on different persons. I had a brother who was very sensitive to its effects. If he came into contact with the smoke in burning brush in the spring when repairing the fences of the farm (which usually had a deal of the vine running on them), all that portion of his body that was exposed to the smoke became much swollen, and it took a long time, with much medical skill, to give him relief. He made a visit to California in 1859, and on his return I was surprised to see him walk up to an ivy vine and bite off and eat the twigs, and rub them over his face and arms. He explained that during his stay in the gold mines he got in contact with the ivy and became terribly poisoned, so much so that he was perfectly blind. An Indian who was there said he could cure him. He got some of the young shoots of the ivy and bruised them and made two quids, put them into his mouth and told him to chew and swallow the juice, which he did, and was a well man in a few hours. I had two sons at that time about eight and six years old; they were present at the time, and seeing their uncle eat the ivy, so soon as they were alone, got to eating it. They came to the house with a bunch of the twigs, and I was much alarmed to see them with it, but it had no bad effects, and they are now men, and can handle it with impunity. I dare not go where it is, and I have two other boys that are like me; but I cannot summon courage enough to try the remedy. Perhaps some of your readers who are afflicted can. I give simple facts in the case for the curious to test. The remedy is alleged to be permanent and to render the patient "ironclad" to all future contact with ivy. S. E. R.

Mathews C. H., Va.

Economy.

To the Editor of the Scientific American:

The advance in modes of heating in districts where petroleum or natural gas is freely found makes the coal cart and wood wagon objects of ridicule, obsolete remnants of a barbarous age. With us, not a hundred miles from Toledo, fashion, if nothing else, compels the "paterfamilias," in order to keep peace in the house, to use natural gas; the cost varying from $20 to $35 per annum for each heater, according to size, so that an ordinary dwelling house, with kitchen, dining room, sitting room, and parlor, will cost about $100, and the extra charge of fitting. With a bathing room, a conservatory, a study, a workshop, or an extra room or two for visitors, the annual bill may easily amount to double this amount. Now, coal oil is in many places nearly worthless, and fifteen cents per barrel, even twenty cents (barrels to be furnished by buyers), appears so cheap that when its heating power is compared with hard or soft coal, the former at $7 and the latter at $4.50 per ton (2½ to 3 barrels crude petroleum oil yielding about as much heat as a ton of coal), students of economy inclined to advance with progressing humanity, and especially readers of the SCIENTIFIC AMERICAN, may be excusable for experimenting in the crude oil heating field—an unexplored and mysterious area of vast and highly promising dimensions. I became an explorer in this *terra incognita*, visited various places where crude petroleum was used as a substitute for coal, and found that, with sufficient air pressure, or injected with and by steam, it worked satisfactorily in furnaces, for mills, machine shops, even in the largest (Oakland and San Francisco) ferry boats. I saw it burn on water, from asbestos packing, charcoal, on cast iron plates, iron cups and saucers; saw an ingenious arrangement to generate steam, produce an air blast in a cheap and compact little apparatus for cooking stoves—a splendid thing, provided the cook would not object to have a nice engineer engaged to keep the apparatus in working condition. Finally, intending to protect home industry, I chose a plain, substantial device—not yet patented—secured 5 barrels of crude petroleum, cost about 1¼ cents per gallon, including transportation and delivery, and began operations.

Oh, my! what a horrid stench! (The mother of my children has an acute organ of smell, and one of the petroleum barrels leaked considerably, and the driving of the hoops on the slippery sides made it bleed more freely yet.) But this was outside in the yard. I found out it keeps stray dogs and tramps away, and promises to last an indefinite time. Work soon began. A new brick outhouse received a tank in the second story, from which pipes were laid to my office, the coal stove remodeled and inlet pipes, stop cock, etc., adjusted. The oil was admitted through a ¼ inch open pipe, against a 2½ by 3 inch inverted cast iron cup, resting on a 6 inch flat, round iron plate, the latter centrally screwed on a circular pot, with partly open sides to admit draught, and an open tube to regulate and exclude all but bottom draught. As a pretty well skilled workman, I got everything in good working order before I admitted the first crude oil. Oh, what hidden glories there were in waiting for an unsophisticated mind! Do any of the readers know how an isolated volume of air works, even in a water pipe? It seems to act as an elastic cushion, until something gives, and, in my case, it was crude petroleum of the usual fragrant quality that filled the stove and, oozing out of the four rod holes, soaked my office floor, before I could imagine why the open stop cock failed to let any oil pass. It came on its own accord, and made up for lost time.

My wife—well, she did not stay long. I scooped and mopped and scraped, and lit my stove. Oh! how it roared! Glory hallelujah! I had my stove red hot in a few minutes. I shut down my valve and it gradually assumed a milder tone, and suddenly it went out. I let on a little oil again, but only smoke, white, dense smoke, issued. I let on more oil and lit a match, opened the door a very *leetle*, and I had a first class surprise party. I have not much hair to lose, but I may save one-half of the barber's fees. I looked much younger. My gray whiskers had their former younger color, and what my eyebrows lost in hair they gained in compactness and color. The stove lid failed to hit me, when it came down from the ceiling, but the accompanying soot hit everything. My wife calls it of a greasy, sticking character. It gives her much trouble. The hinges of the stove door are well constructed. They became used to these explosions. Well, I managed by close attention to get along a few days with an occasional surprise party, assembled in various dishes, as cans, cups, and pans, a fine by-product, a heavy lubricating oil, that seems to get everywhere and always sticks, used about a cake of soap and half dozen towels to clean my hands, and a peck of sawdust and untold quantities of rags a day, to gather up the remnants of incomplete combustion from the floor, tin plate under the stove, and the cup in the stove. Finally discarded the inverted cup—one improvement; then unscrewed circular plate and threw it out—another improvement; and then I thought I got on top of the hill; but the cold weather came, the oil would not run, the fire went out a dozen times an hour. I overhauled the apparatus, cleaned it out, used two coats up, and cuffs! I think the stuff is the best indelible marking ink out. Well, my wife, she had to help me this time. "Now, you hold your finger over this pipe and raise your hand as a signal, when you feel the oil come, and then quickly close the valve." I hastened to apply a well working air pump to my tank in the outhouse, watching through the open door and window my wife's anticipated signal. I pumped lustily, the chinks and bulges of my tank came out with a report, but I only saw my wife run. I stopped pumping, made haste down stairs, across the lawn, up stairs to my office. Well, the surprise party was on my wife, the treacherous pipe failed to work. First, she let go her finger to look, then it worked with a will (my air pump is a daisy). She—my wife—was excusable. She could not see the stop cock, and under the pressure of the condensed air my petroleum fountain worked nicely, until I turned the stop cock. *My office floor is painted now.* I made peace with my wife. Three days after she had natural gas all over the house. But I am writing to the music of my crude oil stove yet. Never give up. Just finished a second crude oil burner for a cellar and greenhouse above. I find the mastery of this subject is elevating (sometimes stove lids), and is a trial for a religiously constructed temperament. It is a labyrinth in which the seeker for an exit can educate a fine power of observation, study expansion of fluids and solids, and like the hunting dog in last SCIENTIFIC AMERICAN, trace his master by the smell. Crude oil is my master yet, but I am about mastering it. Will be ready to negotiate with some one of large means to secure a patent for the coming event. K.

A Channel Bridge.

The following details of a proposed bridge across the English Channel are taken from a French contemporary: The *Evenement* of October 25 states that a scheme for the erection of such a bridge is in active consideration on the other side of the water. At the head of the project is Admiral Cloue, and acting in connection with him are three well known engineers, Messrs. Hersent, Fowler, and Baker, the two latter representing England in the matter. The plans have already been prepared, and are at present being examined by skilled engineers at the Creusot Works. As the *conseil superieur des ponts et chaussees* is not unfavorable to the scheme, as soon as the plans are approved, active measures, it is expected, will be shortly begun. It is estimated that the cost will be somewhere about £40,000,000, and the time required before it can be completed seven years or more. The course proposed to be taken for the bridge is from Cran-aux-Œufs, a little place on the French coast between Ambleteuse and Cape Gris-Vert, to Folkestone, on the English side, a distance of about 23 miles. Not the shortest, but the shallowest line will be chosen. The depth of the Channel is commonly supposed to be much greater than it is in reality. There are two shallows between Cran-aux-Œufs and Folkestone where the depth is only about 20 feet. They are named the Colbart and the Warne, and they will, of course, make a material difference in laying the foundations and huge piles which will be required for this gigantic structure. From the French coast to the first of these shallows the depth is about 160 feet, and from the other shallow to Folkestone about 100 feet. The bridge will have two slight bends, the first deviating a little to reach the Warne, the other other falling back to reach Folkestone. The piles required are blocks of concrete and masonry, 160 feet long by 100 broad, and will be placed at intervals of about 550 yards. These measurements sound enormous, but it is stated to be quite possible that they may have to be increased to give the bridge a strength capable of bearing a weight of 25,000 tons. The causeway of the bridge will be about 160 feet above the sea level, so that vessels of any size may be able to pass beneath it. It will be 100 feet wide, and be divided into four lines for train service, as well as a way for foot passengers. Signal boxes and sidings will be placed along the whole length at equal distances. The bridge will be illuminated by electric light, each pile having a powerful electric lamp attached to it, as well as fog horns and alarm bells for use in foggy weather. Such are the outline details of this enormous undertaking, which the projectors state they have full confidence will be before long carried out.—*London Times.*

Nickel Plating.

M. Joseph Arene, the French Vice-Consul at Mons, in Belgium, calls attention in a recent report to a new process of nickel plating now in successful operation in his district. By this process a thick plating of nickel may be deposited upon any metal by a feeble electric current in a very short space of time. He gives the composition of the bath as follows: Sulphate of nickel, 1,000 kilo.; neutral tartrate of ammonia, 0·725 kilo.; tannic acid, 0·005 kilo.; water, 20 liters. The neutral tartrate of ammonia is obtained by saturating a solution of tartaric acid by ammonia. In the same manner the sulphate of nickel must be exactly neutralized. Three or four liters of water are at first added, and the solution is made to boil about a quarter of an hour. The rest of the water is then added, and the liquid is filtered or decanted. This bath may be renewed indefinitely by adding the same materials and in the same proportions. The deposit obtained is brilliantly white, soft, and homogeneous. Even when obtained of great thickness there are no irregularities on the surface, and it has no tendency to scale. Some very thick deposits of nickel upon both rough and polished cast iron goods have been obtained by this process at a cost scarcely exceeding that of copper.

ENGINEERING INVENTIONS.

A car axle box has been patented by Mr. Stephen R. Stinard, of Pompton, N. J. The invention consists in fitting a tray having inclined or sloping side walls into the axle box below the axle journal, whereby the setting oiled waste will be forced or crowded against the axle journal and the lubricant be retained in the tray.

A metallic packing has been patented by Messrs. William E. and Frederick G. Brockett, of Park City, Utah Ter. It consists of a gland-like packing ring with lubricant-holding groove combined with fractional packing rings having sloping backs and grooves or recesses, in connection with a special form of stuffing box, being specially adapted for piston rods, valve stems, expansion joints for pipes, etc.

A railway train timer has been patented by Mr. George W. Housel, of Bloomsbury, N. J. This invention covers a special construction of clock and auxiliary features designed to indicate to engineers or trainmen when the last train passed the indicator, as well as the time of day, so that the engineer may know by a glance at the instrument the exact time between his train and the one preceding him.

A splice bar for railroad rails has been patented by Mr. Jonas Potter, of Morrellville, Pa. It consists of a plate with a central chair and end chairs, the rail having its base cut away to the face of the web at each side to form opposite rabbets in the base at the end, and recesses beyond the rabbets, making an economical and effective means of splicing the rails and securing them to the sleepers.

AGRICULTURAL INVENTIONS.

A combined potato digging and harvesting machine has been patented by Mr. Arthur P. W. Wade, of Cedar City, Mo. This invention covers a novel construction, combination, and arrangement of parts in a machine by which the potatoes are plowed out of the ground, separated from the dirt and sticks, and transferred to a wagon or dropped in a row alongside the machine.

A double cutter bar has been patented by Mr. William T. Wardall, of near Manly Junction, Iowa. Combined with two cutter bars and their cutters a spacing strip is arranged between the sections of the finger bar and formed with slots through which the connecting bolts pass, making a double cutter bar which will not clog, and with the parts so constructed that the cutters may be adjusted to operate in the most effective position.

MISCELLANEOUS INVENTIONS.

A curry comb has been patented by Mr. William R. Adams, of Omaha, Neb. The body portion has one toothed face and one plain face, the handle device being held adjustably to the body to allow either face to be used, the handle device consisting of a leather plate and a handle strap.

A saw gauge has been patented by Mr. Edward S. Nixon, of near Chattanooga, Tenn. It is a novel device which can be readily applied to a block or board to be sawed, and held firmly in place thereon, to accurately guide the saw in the direction in which the block or board is to be cut.

A churn has been patented by Mr. William W. Perkins, of Palouse, Washington Ter. A cup-shaped dasher is journaled to rotate in a cream vessel, the dasher having a closed top, a bottom opening and side port, with a radial wing or piston operating when the dasher is rotated to force the cream through the port, and thus cause the butter to come quickly.

A combined mail bag fastener and tag holder has been patented by Mr. Henry N. Ockford, of Jackson, Mich. The body portion has a cross pin and a clamp for holding the mail bag ropes, and a tag holder with an eye to receive the pin of the fastener, with other novel features, for conveniently locking the bag and carrying its indicator tag.

A boot or shoe stretcher has been pa- tented by Mr. Lloyd Nottingham, of Norfolk, Va. It is adapted for stretching a boot or shoe in length as well as width and in the instep portion, the invention covering a novel construction and adaptation of parts, whereby also the stretcher may be used in stretching two boots or shoes at the same time with one screw.

The manufacture of white lead forms the subject of a patent issued to Mr. William P. Talbot, of Brooklyn, N. Y. The invention covers an improved article of manufacture, being a circular lead buckle cast on one face with blade-like ridges on opposite sides of the diameter of the buckle, whereby the ribs will be quickly corroded with the body of the buckle.

A sleigh shoe has been patented by Mr. George A. Stevens, of Hartsville, Mass. It is of that class having a dovetailed groove in its inner face for receiving the bolt for securing the shoe to the runner, the invention covering the formation of the groove and the combination therewith of a bushing of suitable relative shape.

A spirit level has been patented by Mr. Enos F. St. John, of Highland Station, Mich. It consists of a circular tube partially filled with spirit or other proper liquid, mounted in connection with a semicircular graduated plate, whereby the instrument may be used for obtaining level or perpendicular lines or intermediate angles.

A kitchen cabinet has been patented by Mr. John G. Shahfer, of Clay City, Ind. It consists of a case with extension cupboard having centrally hung or pivoted safes, each with semicircular sides and back, the safes being adapted to discharge their contents without the use of a scoop or other means usually employed for that purpose.

A chain wrench has been patented by Mr. William H. Brock, of Brooklyn, N. Y. It is a pipe wrench of novel make, designed to give greater ease in applying the wrench to the pipe, the getting of a firmer and more manageable grip, while making a strong wrench and one which can easily be repaired or parts replaced when worn.

A felly bolt has been patented by Mr. Duncan W. McKinnon, of North Sydney, Cape Breton, Nova Scotia, Canada. The bolt and nut are formed with re-enforcing sections, the head of the bolt being nicked after the manner of an ordinary wood screw, making an improved bolt for preventing the splitting of the fellies without detracting from their appearance.

A floor jack has been patented by Mr. John L. Fredericks, of La Grangeville, N. Y. Combined with a brace bar having a spur and head adapted to be struck by a mallet is a pivoted lever and a push bar pivoted to the lever with a series of notches on its under edge, a block pivotally attached to its free end, with a link connecting the push and brace bars.

A conduit for electric conductors has been patented by Mr. Edward E. Greene, of New York City. Its sections are designed to replace and serve as the ordinary curb, and are cast or moulded in iron, artificial stone, or other suitable material, ducts for the conducting cables extending longitudinally through the sections, making a conduit which can be cheaply and easily laid, and affording ready access to the conductors.

A mop wringer and scrubbing brush holder has been patented by Messrs. Zotique R. La Fleche and Joseph A. Ledoux, of Concordia, Kansas. It is so made that the mop may be wrung by winding it upon a roller by means of a small crank, while the brush, pivoted in short arms, may be clamped in any desired position, the device being simple, convenient, and effective.

SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY NUMBER.

TABLE OF CONTENTS.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

December 20, 1887,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Dental foil, R. S. Williams ... 375,241
Depurator, W. E. Smith ... 375,015
Dishes, manufacturing butter, C. Crock ... 375,264
Ditching machine, C. V. Touhy ... 375,085
Door check, N. Peterson ... 375,094
Door operating device, W. H. Dittmer ... 375,138
Doors and windows, hanger for sliding, R. Clarke. 375,210
Dough press, continuous, J. J. Langlos ... 375,163
Draught equalizer, J. Martin ... 375,062
Dress shield, M. E. Wheeler ... 375,219
Dry closet, C. G. Short ... 375,207
Dry house, W. S. Wootton ... 375,306
Dumb waiter, G. M. Emerick ... 375,146
Dust pan, convertible, Mignault & Prichard ... 374,986
Educational appliance, R. S. Pollard ... 375,095
Egg beater, W. P. Dodson ... 375,274
Elastic fabric, J. Kayser ... 375,073
Electric machine, dynamo, J. Gray ... 374,969
Electric motor and fan, combined, H. H. Blades .. 375,265
Electrical circuit closer, M. M. Welch ... 375,238
Electrical distribution apparatus, cut-out for, M. M. M. Slattery ... 375,014
Electro pneumatic mechanical movement, H. L. Roosevelt ... 375,001
Elevator. See Passenger elevator. Water elevator.
Employe's recorder, B. F. Merritt ... 375,087
Engine. See Compound engine. Fire engine. Gas or gasoline engine. Road engine. Water engine
Excavator, G. Cox ... 375,122
Fabric. See Elastic fabric. Waterproof gossamer fabric.
Feed water heater, J. E. Gill ... 374,956
Felly bolt, D. W. McKinnon ... 375,177
Fence, I. B. Horner ... 375,292
Fences, machine for constructing, P. Allen ... 375,116
Fencing machine for making picket, L. T. Curtis. 375,305
Fertilizer distributer, J. L. Dow ... 375,052
Fetlock support for colts, J. A. Reid ... 374,996
Fire engine, hand pump, A. D. Elliott ... 375,317
Fire escape, W. Fitzpatrick ... 375,279
Fire escape, F. A. Westbrook ... 375,031
Fire escape ladder, N. Thelen ... 375,107
Fire extinguisher for cars, E. P. Muller ... 375,181
Fire fender, T. Ellison ... 374,951
Fire kindler, G. E. & W. H. Baker ... 375,309
Fireplace, D. C. Purvis ... 375,195
Fires in cars and other places, automatic apparatus for extinguishing, I. T. Dyer ... 375,314
Fish trap, A. H. McDowell ... 375,175
Floor jack, J. L. Fredericks ... 375,147
Frame. See Grindstone frame.
Furnace. See Gas retort furnace. Heating furnace. Smoke consuming furnace.
Furnace, A. Ritter, Jr. ... 374,999
Furnace, L. Ryan ... 375,002
Furnace grate, J. De Pereira ... 375,136
Gauge. See Saw gauge.
Galvanic battery, J. Serson ... 375,007
Galvanic batteries, carbon electrode for, C. H. Wilder ... 375,034
Garment, bifurcated, J. Stiefel ... 375,219
Gas and electric light fixture, combined, S. Bergmann ... 375,117
Gas, apparatus for making fuel, Huidekoper & House ... 375,161
Gas burner, W. M. Jackson ... 375,070, 375,071
Gas lighting apparatus, electric, C. B. Bosworth .. 375,118
Gas or gasoline engine, B. F. Kadel ... 374,968
Gas retort furnace, G. A. McIlhenny ... 375,065
Gate. See Automatic gate.
Generator. See Steam generator. Thermo-electric generator.
Glass preserving jar, M. Anthony ... 375,246
Grain separator, C. D. Edwards ... 375,142
Grain separator and cleaner, W. R. Dunlap ... 374,947
Grate, A. Greenaway ... 375,066
Grinding machine, E. J. Armstrong ... 375,247
Grindstone frame, S. Lewis ... 375,170
Hame attachment, McCalman & Hutchinson ... 374,983
Harness loop, J. Fischer ... 375,277
Harvesting, picking, and husking corn, machine for, W. Spear ... 375,016
Hat stretching machine, W. Simmonds ... 375,013
Hatchway, J. R. Kaiss ... 375,072
Hay carrier track, A. Murchey *et al.* ... 375,089
Hay carriers, pulley stripper block for, T. B. Elliott ... 374,949
Hay loader and staker, M. R. Jenkins ... 374,966
Heater. See Feed water heater. Portable heater.
Heating furnace, Howard & Burden ... 374,965
Hedge trimming machine, R. Hildebrand ... 374,964
Hinge, Fisher & Burnet ... 374,954
Hinge, J. Wright ... 375,088, 375,089
Hitching device, W. G. Thorpe ... 375,227
Hod, C. Carlson ... 375,120
Holder. See Cuff holder. Picture holder. Square holder. Tool holder.
Hook. See Whiffletree hook.
Horse power for gin houses, W. Deering ... 375,271
Horseshoe, J. D. Billings ... 374,924
Hub boring machine, F. R. Deming ... 374,945
Ice creeper, A. T. Williams ... 375,110
Incubators, thermotic regulator for, A. Wiley ... 375,035
Indicator. See Station indicator. Steam engine indicator. Temperature indicator.
Insecticide, W. Cromwell ... 375,263
Insulated electrical conductor, A. Kissel ... 375,316
Insulator, E. C. Emery ... 375,276
Ironing and bosom board, I. W. Legg ... 374,980
Irrigating purposes, apparatus for, J. Thompson .. 375,021
Jack. See Floor jack.
Jar. See Glass preserving jar.
Journal lubricator, C. Hildebrand ... 375,291
Kitchen cabinet, J. G. Shahfer ... 375,304
Knife for finishing waterproof fabrics, T. H. Videto ... 375,305
Knitting machine, circular, J. R. Heinse ... 375,156
Ladder, J. T. Lusmoor ... 375,079
Ladder, extension, P. W. Bailey ... 375,250
Ladder spike, E. S. Bacon ... 375,249
Lantern, tubular, J. H. Stone ... 375,010
Lathe head stocks, lock for, C. H. Weston ... 375,032
Lawn sprinkler, serpentine, Gumaer & Knoll ... 374,900
Leather, machine for ornamenting, E. B. Stimpson ... 375,165
Lemon squeezer, J. A. Hurley ... 375,288
Level, spirit, E. F. St. John ... 375,223
Leveling rod, W. J. Ritchie ... 375,197
Life-saving apparatus, P. Carolan ... 375,047
Liniment, J. Gray ... 374,958
Liquid separator, centrifugal, C. D. B. Shepard ... 375,012
Lock. See Nut lock.
Locomotive injector, automatic, F. W. Kremer ... 374,975
Loom, J. Cowgill ... 375,131
Loom, circular, A. De Laski ... 375,135
Loom shuttle, I. Cross ... 375,265
Loom shuttle, F. H. Stetson ... 375,104
Looms, temple plate for power, J. J. Hosan ... 375,160
Lubricator. See Journal lubricator.
Lubricator, G. W. Bartlett ... 375,310
Lubricator, S. P. Lathrop ... 374,977
Mail bag, J. A. Briggs ... 375,311
Mat. See Wire mat.
Mat, F. Greenland (r) ... 10,889
Measuring cloth, device for, C. Tuxbury ... 375,026
Measuring machine, cloth, J. C. Dale ... 375,269
Measuring the flow of liquids in conduits, indicator for, C. B. Dudley ... 375,054
Medical compound for dyspepsia, etc., A. Marx ... 375,173
Medicine, remedy for diseases of the liver, etc., A. Woodard ... 375,112
Meter. See Water meter.
Middlings purifier, F. Prinz ... 375,194
Mill. See Crushing mill.
Mop wringer and scrubbing brush holder, La Fleche & Ledoux ... 375,166
Mortising machine, endless chain, C. H. Douglas .. 374,946
Motor. See Pump motor. Electric motor.
Mowers and reapers, gearing for, W. Lynch ... 375,172
Musical instrument, S. J. Talbott ... 375,224
Nail making and distributing machine, C. C. Small ... 375,209
Nails, machine for making cut, Sweet & Allison .. 375,302
Nut lock, J. C. Johns ... 375,234
Oil cup, lubricating, S. P. Lathrop ... 374,979
Oil mills, water ball breaker for, W. Krutzsch ... 375,165
Ordnance, hydraulic mechanism for operating, C. H. Murray ... 374,990
Packing, metallic, W. E. & F. G. Brockett ... 375,258
Pan. See Amalgamating pan. Dust pan.
Passenger elevator, S. K. Humphrey ... 375,293
Pavement, artificial, E. J. De Smedt ... 375,273
Pavement, asphalt, J. Stansfield ... 375,018
Pencil sharpener, J. Seymour ... 375,009
Pencils, compass attachment for, C. W. Boman ... 375,257
Photographic accessory, J. W. Tinsman ... 375,230
Photographic backgrounds, supporting frame for, for, L. W. Seavey ... 375,006
Photographic negative plate, C. H. Tunndorff ... 375,231
Pianofort action, upright, E. Q. Norton ... 375,297
Piano tuning pin, F. E. H. Goodenow ... 375,150
Picture holder, E. Pachtmann ... 375,189
Pigment, white, J. B. Freeman ... 375,060
Pile or pier, C. Delafield ... 374,944
Pin. See Piano tuning pin.
Pipe. See Tobacco pipe.
Pipe coupling, J. Bersch ... 375,256
Pipes, etc., apparatus for carbonizing cement, J. H. Walsh ... 375,236
Pipes, reducing the ends of, E. O. Daniels ... 375,050
Planers, stave jointing attachment for bed, J. Greig ... 375,153
Planter, hand corn, E. J. Hamby ... 375,286
Plow attachment, E. G. Goddard ... 375,283
Plow, lister, E. P. Lynch ... 375,081
Portable heater, E. B. Warren ... 375,109
Potato digging and harvesting machine, combined, A. P. W. Wade ... 375,235
Powder. See Blasting powder.
Power. See Horse power.
Power apparatus, operation of motive, M. Blumrich ... 374,926
Press. See Baling press. Cider press. Dough press.
Printing presses, ink fountain for, D. S. Clark ... 375,126
Projectile, explosive, C. C. Palmer ... 375,190
Propelling and steering vessels, means for, J. Merlette, Sr. ... 374,985
Pump, N. Perkins ... 374,995
Pump, I. J. Sehorne ... 375,303
Pump, B. C. Vandusen ... 375,027
Pump motor, railway, W. Tiffany ... 375,024
Punch and register, ticket, Kimpton & Crisp ... 374,973
Railway, cable, J. B. Heverling ... 375,290
Railway grip, cable, J. B. Heverling ... 375,283
Railway rails, fish plate for, W. B. Chisolm ... 375,124
Railway rails, splice bar for, J. Potter ... 375,193
Railway signal, J. H. Gibson ... 375,063
Railway, street, R. A. Cheesbrough ... 375,128
Railway switch, R. W. Cloud ... 375,048
Railway tie, metallic, R. S. Sea ... 375,008
Railway train timer, G. W. Housel ... 375,160
Railways, automatic catch for inclined, J. Schuller ... 375,203
Recorder. See Employe's recorder.
Refrigerating machine, A. Osenbruck ... 375,188
Refrigerator car, C. C. Palmer ... 375,191
Register, F. Lumbert ... 374,976
Road engine, W. S. Wootton ... 375,307
Roaster. See Coffee roaster.
Rocking chair, Lochbihler & Edloff ... 375,225
Rod. See Leveling rod.
Ruler and protractor, combined parallel, H. S. Gay ... 374,955
Saddle and yoke, combined cart, T. Ivey ... 375,162
Sash balance, J. Bastian ... 375,252
Saw, buck, J. F. French ... 375,061
Saw, drag, F. N. Popperling ... 374,994
Saw gauge, E. S. Nixon ... 375,187
Sawmills, slide block for reciprocating, E. Haake. 374,285
Saw set, C. Morrill ... 375,088
Scale, automatic grain weighing, H. Cutler ... 375,267
Scale, automatic weighing, W. R. Smith ... 375,102
Scales, stock rack for platform, O. T. Boulton ... 374,927
Scarf fastener, E. Mazatis ... 375,174
Screw blanks, device for holding and guiding, C. D. Rogers ... 375,097
Screw bolt, E. D. Shelton ... 375,206
Screws, die for swaging the points and threads of wood, C. D. Rogers ... 375,098
Screws, self-adjusting die for swaging wood, C. D. Rogers ... 375,099
Seeder or grain planter, E. P. M. Robinson ... 375,198
Seeding machine, J. B. Williams ... 375,036
Separator. See Grain separator. Liquid separator.
Sewing machine binding attachment, J. R. Ready 375,196
Sewing machine, boot or shoe, J. Albrecht ... 375,244
Sewing machine buttonhole attachment, W. E. Trull ... 375,304
Sewing machine motor brake, W. Naab ... 375,184
Sewing machine shuttle, D. H. Campbell ... 374,987
Sewing machine tension device, F. Meyer *et al.* ... 374,986
Sewing machine, wax thread, D. H. Campbell ... 374,934
Sewing machines, take-up device for wax thread, D. H. Campbell ... 374,936
Sheet delivery apparatus, J. Brooks ... 374,930
Shelving, movable, F. V. Comfort ... 375,128
Shingle machine, J. P. Ferrenburg ... 374,958
Shirt stretcher, E. H. Iveson ... 375,069
Shoe fastener, J. H. McHenry ... 374,984
Shoe shank burnisher, L. C. Kenton ... 374,972
Shoe sole edge setter, L. C. Kenton ... 375,074
Shutter fastener, F. B. Mallory ... 374,981
Shutter worker, E. F. Goodwin ... 375,151
Signal. See Railway signal.
Signal box, M. Martin ... 375,088
Sled, J. H. Elward ... 375,145
Sleigh, W. Schan ... 375,003
Sleigh shoe, G. A. Stevens ... 375,214
Slippery elm tent, Nichols & Shepard ... 375,186
Smoke consuming furnace, F. Leadbeater ... 375,169
Sponge cup, R. F. Furtick ... 375,057
Spring. See Vehicle spring.
Sprinkler. See Lawn sprinkler.
Square holder, T. A. J. Weed ... 375,030
Stand. See Boiler stand.
Station indicator, T. W. Munroe ... 375,186
Station indicator, R. H. Neumann ... 375,186
Station indicators, automatic mechanism for, T. W. Munroe ... 375,182
Steam boiler, O. H. Gentry ... 375,202
Steam boiler, radial tube, E. S. T. Kennedy ... 375,294
Steam boiler safety plug, J. Bewsher ... 375,041
Steam engine indicator, A. C. Meady ... 375,086
Steam generator, White & Chamberlain ... 375,033
Stirrup, G. Nixon ... 374,992
Stirrup, J. W. Stallcup ... 375,103
Stove, heating, E. B. Colby ... 374,939
Stovepipe collar, G. Koeb ... 374,974
Stoves, safety attachment for railway car, J. Tilton ... 375,229
Supporter. See Suspenders and stocking supporter.
Suspender, C. A. Shattuck ... 375,010
Suspenders and stocking supporter, combined, S. E. Stevens ... 375,216
Suspenders, slide loop for, C. Williams ... 375,240
Switch. See Railway switch.
Tablets, binder for, F. E. Busch ... 375,046
Taper tap, J. Gribben ... 374,284
Target, flying, M. A. Harsen ... 374,961
Teeth, filling, C. H. Land ... 375,176
Telegraph, municipal, M. Martin ... 375,299
Telephone cord tip, F. A. Forbes ... 375,280
Telephone exchange, mechanical, W. H. Eastman ... 375,316
Telephone, mechanical, Eastman & Adams ... 375,315
Temperature indicator, distant, C. G. Short ... 375,208
Thermo electric generator, E. G. Acheson, 375,242, 375,243
Thill coupling, C. Stilwell ... 375,220
Thread and winding it into cops, machine for waxing, D. H. Campbell ... 374,935
Tie. See Railway tie.
Tiles for sidewalks, etc., manufacture of illuminating, T. Sharts ... 375,101
Tilting chair, J. W. Kenna ... 374,971
Tilting chair iron, J. W. Kenna ... 374,970
Tire, vehicle, W. Fox ... 375,281
Toaster or meat broiler, bread, Harkins & Willis .. 375,288
Tobacco pipe, W. M. Eccles ... 375,140
Toboggan, W. Blesh ... 375,042
Tool holder, C. Francis ... 375,059
Torpedo, railway, J. H. Bevington ... 375,254
Trace fastening, R. Terry ... 375,226
Transoms, etc., pivotal support for, W. P. Davis .. 375,051
Trap. See Fish trap.
Tricycle, A. E. McEntee ... 375,176
Trousers, B. Goodman ... 374,957
Trousers stretcher, W. A. & H. S. Rollins ... 375,100
Tube cutter and ratchet drill, combined, O. Kalkhoff ... 374,969
Tube expander, Babcock & Champion ... 375,248
Tube expander, J. P. Champion ... 375,259
Tubes, manufacture of metallic, J. L. Bogert ... 375,043
Tug, hame, R. Hassel ... 374,962
Type and method of producing the same, die for making wood, G. C. Setchell ... 375,008
Type, producing dies for use in making wood, W. H. Page ... 374,998
Type writing machine, G. W. Baldrige ... 375,251
Type writing machine, Garner & Laganke ... 375,062
Type writing machine, A. Mills ... 375,178
Valve, automatic safety, Wallace & Wyman, Jr. ... 375,029
Valve, engine, J. H. Elward ... 375,144
Valve, steam-actuated, G. T. Parnell ... 375,091
Vehicle boot, Youtsey & Higgin ... 375,113
Vehicle gear, E. A. Gardiner ... 375,148
Vehicle running gear, S. N. Beigum ... 374,923
Vehicle spring, C. M. Blydenburgh ... 375,256
Vehicle, two-wheeled, L. Cooney, Jr. ... 375,129, 375,130
Vehicle, two-wheeled, Hare & Sproul ... 375,287
Vehicle wheels, rubber for, F. W. Johnson ... 374,967
Ventilating and changing the temperature of buildings, H. Tilden ... 375,228
Ventilator, Mignault & Prichard ... 374,987
Vulcanizing machine, A. C. Squires ... 375,617
Wagon brake, automatic, T. B. Elliott ... 374,950
Wash boilers, steam fountain for, S. J. Dawkins .. 375,134
Washing machine, W. I. Fitch *et al* ... 375,278
Water closet, P. G. Hubert ... 375,068
Water elevator, M. Stevens ... 375,215
Water engine, G. & W. Ross ... 375,200
Water meter, disk, Thomson & Lambert ... 375,023
Water meter, rotary, J. A. Tilden ... 375,108
Waterproof fabrics, making rubber striped, T. H. Videto ... 375,234
Waterproof gossamer fabric, T. H. Videto ... 375,253
Weather vane, L. W. Schaufuss ... 375,201
Weighing apparatus, grain, G. P. Jameson ... 375,163
Welding, electric, E. Thomson ... 375,022
Wheel. See Car wheel.
Wheel, J. Dunstedter ... 375,056
Wheel, W. A. Forman ... 375,058
Whiffletree hook, I. C. Burgett ... 374,932
Windmill, A. Anderson ... 375,245
Window, A. H. Roger ... 375,000
Wire cutting and crimping apparatus, T. Conners. 375,312
Wire mat, F. C. Guilleaume ... 375,031
Wire springs, machine for making coiled, C. Graham ... 375,064
Wire stretcher, J. B. Cleaveland ... 375,127
Wood splitting and chopping machine, T. P. Chen ... 375,122
Wrench. See Chain wrench.
Wrench, H. Bowhall ... 374,928
Wrench, J. M. Haynes ... 375,155
Wringer. See Mop wringer.
Yoke, neck, E. P. Lynch ... 375,080

DESIGNS.

Carpet, H. Fawcett ... 17,967 to 17,969
Carpet, J. L. Folsom ... 17,970
Carpet, A. L. Halliday ... 17,973
Coal grate or basket, J. H. Hankinson ... 17,974
Costume, lady's, J. Sheils ... 17,976
Eraser, rubber, G. A. Goldsmith ... 17,971, 17,972
Letter heads, etc., ornamentation of, G. G. Ward .. 17,977
Range or cooking stove, E. L. Calely ... 17,953
Seal, camp, A. P. Davis ... 17,964
Skirt, lady's walking, H. F. Duke ... 17,965
Snap hook, O. P. Letchworth ... 17,975
Stove, heating, W. H. Wilkinson ... 17,978
Waist, lady's evening, H. F. Duke ... 17,966

TRADE MARKS.

Belting, rubber, Revere Rubber Company ... 15,042
Carpet beaters, Simmons & Tullidge ... 15,044
Cigars, S. S. Sleeper & Co. ... 15,057
Clothes pins, wooden, Dodge, Meigs & Co. ... 15,084
Cotton and woolen fabrics, woven, China and Japan Trading Company ... 15,080
Cotton gins, Eagle Cotton Gin Company ... 15,085
Cough cure, H. M. Boardman ... 15,049
Florida water, Lazell, Dalley & Co. ... 15,087
Flour, J. W. Matthews & Co. ... 15,039
Hay rakes, horse, Ohio Iron Wheel Company ... 15,040
Jewelry, J. F. Hopkinson & Co. ... 15,068
Medicated gum for curing toothache, E. H. Rath *et al.* ... 15,066
Medicated soaps, pills, ointments, salves, and dental preparations, Ichthyol-Gesellschaft Cordes, Hermanni & Company ... 15,054
Medicinal remedies, certain named, P. Hochstrasser ... 15,082
Medicine for the cure of malaria, chills, and ague, A. H. Tiers *et al.* ... 15,058
Periodicals and books, W. Harris ... 15,036
Pills, H. S. Wedmore ... 15,060
Pine lumber and timber and sawed cypress shingles, sawed pitch, L. H. Green ... 15,061
Plumbers' stench traps, Brandeis & Dougherty ... 15,083
Prints and cotton piece goods, Arnold Print Works ... 15,047, 15,048
Pumps, steam jet, W. J. Sherriff ... 15,043
Soaps, cosmetics, hair oils, and perfumes, perfumed, W. S. Thomson ... 15,045
Toilet lotion, A. M. McCorrison ... 15,055
Washing powder, E. R. Olin ... 15,041
Watch mainsprings, H. Zimmern ... 15,046
Woolen, worsted, hair, silk, and cotton piece goods, and piece goods containing a mixture of the same, Maddocks, Booth & Co. ... 15,038

A printed copy of the specification and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 361 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Scientific American FOR 1888.

The Most Popular Scientific Paper in the World.

ESTABLISHED 1845.

☞ Circulation Larger than all Papers of its Class Combined.

Only $3.00 a Year, including postage to United States and Canada. $4.00 a year, including postage to all countries in the Postal Union.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT (see prospectus below) will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of **seven dollars** by the publishers.

The safest way to remit is by Postal Order, Draft, or Postal Note. Money carefully placed inside of envelopes, securely sealed, and correctly addressed seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a distinct paper from THE SCIENTIFIC AMERICAN, but it is uniform in size with it, every number containing 16 octavo pages. THE SCIENTIFIC AMERICAN SUPPLEMENT embraces a very wide range of contents, covering the most recent and valuable contributions in Science, Mechanics, Architecture, and Engineering from every part of the world. Every number contains several illustrations, consisting in part of important engineering works, in progress or completed, both at home and abroad. It presents the most recent papers by eminent writers in every department of science, and every number contains information useful to engineers in every department of industry, civil, mechanical, electrical, etc.

Translations from French, German, and other foreign journals, accompanied with illustrations of Grand Engineering Works; also of Naval and Mechanical constructions of magnitude, projected, progressing, and completed, at home and in all countries abroad.

The most important papers read at Scientific Conventions by the best and most profound thinkers, will be found in THE SCIENTIFIC AMERICAN SUPPLEMENT. This paper, when preserved and bound, forms a most useful encyclopedia of information, and presents a complete history of the progress of the times in the Sciences, Arts, and Mechanical Engineering. This paper contains no advertisements.

Price—$5 a year, in advance; or one copy of THE SCIENTIFIC AMERICAN (see prospectus above) and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT both mailed for one year for $7, payment in advance to the publishers. Remit by mail and address

MUNN & CO.,
Publishers Scientific American,
361 Broadway, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, THE SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British Colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, and all States of Central and South America. Terms, when sent to foreign countries, Canada and Mexico excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal or express money order, or draft to order of

MUNN & CO., 361 Broadway, New York.

Architects and Builders Edition

$2.50 a Year. Single Copies, 25 Cents.

This is a Special Trade Edition of THE SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains about forty large quarto pages, equal to about two hundred ordinary book pages, forming, practically, a large and spendid **Magazine of Architecture,** richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as this edition of THE SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and improved building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world. The subscription price of this publication is $2.50 a year, or one copy of the SCIENTIFIC AMERICAN and Architect and Builders Edition to the same address $5. Single numbers mailed, 25 cents. For sale and subscriptions received by all news dealers. Address

MUNN & CO., Publishers,
361 Broadway, New York.

USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address,

MUNN & CO., 361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.